Exploring Sleep Quality, Quality of Life, and Seizure Frequency in Patients with Psychogenic Nonepileptic Seizures

A Dissertation Presented for the

Doctor of Philosophy

Degree

The University of Tennessee, Knoxville

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December 2022

Dedication

This dissertation is dedicated to the people who made this achievement possible. To my husband Todd Cobb, thank you for your infinite patience and support. To my parents Charles and Mary Jones, thank you for instilling in me the curiosity and desire to learn. And to Dr. Ken Phillips, thank you for encouraging me to pursue a doctoral degree in the field I love.

Acknowledgements

I wish to offer my sincere thanks to my dissertation committee members Dr. Sagherian, Dr. Beebe, Dr. Thomas, and Dr. Vaughn for sharing their expertise and guiding me through the preparation and completion of this dissertation. A special thanks is owed to Dr. Sagherian for being my advisor and chair of my dissertation committee. Thank you for your continued support and guidance.

I would also like to acknowledge Dr. Gunther, who was a member of my dissertation committee before her passing. She was such an inspiration to me during my time in the graduate program and taught me how to convey my ideas in a way that would be most impactful.

I am grateful for the support of the Tennessee Fellowship for Graduate Excellence program at the University of Tennessee Knoxville, and for the opportunity to work as a graduate research assistant for so many distinguished professors in the College of Nursing. I am thankful for the dissertation funding I received from the Sara Rosenbalm Croley Endowed Dean Chair fund.

Abstract

Patients with psychogenic nonepileptic seizures (PNES) experience episodes of transient neurological dysfunction that mimic epileptic seizures. Because PNES is caused by problems with how the nervous system is functioning rather than a structural problem, it is often described as a problem with the brain's software as opposed to hardware. Patients with PNES are part of a medically complex group who historically have been difficult to treat in part because of their array of symptoms caused by PNES or their comorbidities. Therapeutic goals in this patient population often include improving quality of life (QOL) and reducing seizure frequency. To achieve these goals, therapies must be comprehensive and address multiple domains of the patient experience.

The overall objective of this dissertation research was threefold: to generate a conceptual definition of QOL in PNES; to evaluate current nonpharmacologic PNES treatments and effects on seizure frequency and QOL; and to explore the relationship between sleep quality, QOL, and seizure frequency in patients with PNES. To meet the first objective, an evolutionary concept analysis was performed to clarify concepts and define QOL in the context of PNES. To meet the second objective, an integrative literature review was completed, and it was found that sleep was not a primary topic in PNES therapies. There were also research gaps in how sleep quality relates to QOL and seizure frequency in patients with PNES. To meet the third objective, a cross-sectional exploratory study was conducted on a sample of patients with PNES exploring the relationships between sleep quality, QOL, and seizure frequency, and possible influencing factors.

The findings from this dissertation research showed that sleep quality was associated with the physical but not the mental domain of QOL. It also showed that only the use of sleep medications was associated with increased seizure frequency. There was no significant association between sleep quality and seizure frequency. Psychological distress was significantly related to mental QOL; and employment status, psychological distress, and total number of years with PNES were significantly related to seizure frequency. These findings suggest the importance of screening for and treating sleep problems in patients with PNES.

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Abbreviations and Symbols

ABSM	American Board of Sleep Medicine
ACT	Acceptance and commitment therapy
BSM	Behavioral sleep medicine
CAM	Complementary and alternative medicine
CBT	Cognitive behavioral therapy
CBT-I	Cognitive behavioral therapy for insomnia
CBT-ip	Cognitive behavioral therapy-informed psychotherapy
CDC	Centers for Disease Control and Prevention
CINAHL	Cumulative Index to Nursing and Allied Health Literature
DBT	Dialectical behavioral therapy
EEG	Electroencephalogram
EOT	End of treatment
FNS	Functional neurological symptoms
FU	Follow-up
HRQOL	Health-related quality of life
ISEl-12	Interpersonal Support Evaluation List-12
MBT	Mindfulness-based therapy
MCS	Mental component score
MRI	Magnetic resonance imaging
NP	Nurse practitioner
PCS	Physical component score
PHQ-4	Patient Health Questionniare-4
PIT	Psychodynamic interpersonal therapy
PMHNP	Psychiatric-mental health nurse practitioner
PNES	Psychogenic nonepileptic seizures

PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
PSQI	Pittsburgh Sleep Quality Index
PSS-10	Perceived Stress Scale-10
PTSD	Posttraumatic stress disorder
QOL	Quality of life
QOLIE	Quality of Life in Epilepsy
RCT	Randomized controlled trial
SF-12v2	Short Form 12 – version 2
TLE-MTS	Temporal lobe epilepsy-mesial temporal sclerosis
TOUS	Theory of Unpleasant Symptoms
U.K.	United Kingdom
U.S.	United States

Chapter I: Introduction

Psychogenic nonepileptic seizures (PNES) are a somatoform disorder with clinical manifestations indicating transient neurological dysfunction similar to epileptic seizures, but without the electroencephalographic (EEG) changes as shown for epilepsy patients (LaFrance et al., 2016). These symptoms may include intermittent hypermotor activity, sensory disturbance, cognitive impairment, dissociation, emotional dysfunction, and vocalizations, among others (Garcia, 2020). The disorder is as common as multiple sclerosis and Parkinson's disease (Perez & LaFrance, 2016), and accounts for 30% of the epilepsy monitoring admissions in hospitals (Baslet et al., 2016). PNES also pose a significant burden to both patients and the healthcare system since misdiagnoses and lack of access to diagnostic and treatment services cause considerable delays in proper diagnosis and overutilization of healthcare services.

Patients with PNES suffer from many consequences because of the disorder including increased morbidity and even mortality (Jennum et al., 2019), strained interpersonal relationships, driving restrictions, disability, and stigma (Pretorius & Sparrow, 2015). One particularly challenging part of living with PNES is the high frequency of daily or weekly seizures that occurs in up to two-thirds of patients (Asadi-Pooya & Bahrami, 2019). Another significant challenge is living with poor quality of life (QOL), which may be attributed to frequent somatic symptoms, psychological comorbidities, physical and social dysfunction, and stigma around the disease (Jones et al., 2016; Robson et al., 2018). Because high seizure frequency and poor QOL are so prevalent and debilitating in patients with PNES, they are often used as outcome measures when assessing PNES impact or treatment-related changes.

Patients with PNES may also have problems with sleep. At least 70 million Americans have sleep disorders (Centers for Disease Control and Prevention, 2022), resulting in $16 billion in medical costs each year (National Heart, Lung, and Blood Institute, 2011). Insomnia is the most common cause of sleep disturbance and is linked to higher healthcare utilization (Wickwire et al., 2019). It impacts physical and mental health and predisposes to long-term health problems like cardiovascular, metabolic, autoimmune, and psychiatric disease (Dopheide, 2020;

Grandner et al., 2012; Medic et al., 2017). A small body of research shows high rates of self-reported sleep problems in the PNES population, particularly insomnia (Popkirov et al., 2019). Studies have shown that 70-89% of people with PNES report clinically significant sleep disturbance (Graham & Kyle, 2017; Latreille et al., 2018; Wilkins et al., 2018; Zhang et al., 2009), which is higher than the general population and people with epilepsy (Ohayon, 2011). People with PNES often suffer from comorbid psychiatric conditions that are associated with poor sleep, including depression, anxiety, posttraumatic stress disorder (PTSD), and suicidality (Sutton, 2014). Depressive symptoms and stress are known triggers of PNES, both of which can be reduced through improving sleep (Fang & Li, 2015; Trockel et al., 2011). In PNES, sleep problems are associated with worse somatic symptoms (Latreille et al., 2019), anxiety and depression (Erickson et al., 2019), and functional impairment (Graham & Kyle, 2017). Sleep problems negatively impact the cognitive, social, and physical domains of QOL in the general population (Kyle et al., 2010), yet little is known on how they impact QOL in the PNES population. Moreover, it is unknown if sleep problems are associated with seizure frequency in patients with PNES.

This dissertation research will focus on sleep problems in patients with PNES and its association with the two most important outcomes for this patient group: (1) QOL which is a broad measure of overall wellbeing (Revicki et al., 2000) and yet not well-defined in this population; and (2) seizure frequency which is the most commonly recorded indicator for recovery from PNES (Pick et al., 2020).

Clinical outcomes are increasingly assessed using subjective measures rather than objective ones, as is the case with QOL as a patient-reported outcome measure (Hamilton et al., 2017). QOL is an important phenomenon in the nursing theories of Peplau, Leininger, Rogers, King, and Parse (Plummer & Molzahn, 2009). In the nursing approach to patient care, the assessment of QOL relates to the goals of health promotion and restoration of function (Varricchio, 1990). Measuring QOL can be used as a way to assess a person’s perception of overall wellbeing. In the context of a chronic health problem, it can provide insight into the impact of illness (Wiseman et al., 2018). In assessing QOL, value is “based on subjective functioning in comparison with personal expectations,” and has meaning beyond a person’s health status (Revicki et al., 2000, p. 888).

Numerous studies have shown decreased QOL in the PNES population. A systematic review by Jones et al. (2016) found that depression, dissociation, somatic symptoms, escape-avoidance coping strategies, and family dysfunction were negatively associated with QOL in this population. Moreover, depression was most frequently cited and the strongest predictor of QOL (Jones et al., 2016; Kanner, 2003; Szaflarski & Szaflarski, 2003). In the general population, sleep disturbance is strongly associated with reduced QOL; however, information on the link between sleep and QOL in the PNES population is limited and needs further exploration.

Seizure frequency is an outcome measure that can be easily compared pre- and post-treatment to show changes in prominent clinical manifestations. It is an indicator of health status but is limited to the occurrence of paroxysmal events. Prognosis for patients with PNES is often measured in terms of seizure frequency or remission (Durrant et al., 2011). However, this idea stems from the treatment goal of seizure remission in epilepsy patients, which correlates with improved socioeconomic status and QOL in the epilepsy population, but does not correlate with improvements in the PNES population (Reuber et al., 2005). While seizure frequency is not a comprehensive measure, it is still an important indicator of the presence of potentially debilitating symptoms.

Although to our knowledge there has been no research on sleep and seizure frequency in the PNES population, sleep problems in other populations are known to cause complications that are associated with seizures in people with PNES. For example, seizures in PNES may be associated with dissociation or hyperarousal (Yeom et al., 2021) which can be caused by insomnia in the general population (Anderson & Bradley, 2013; Van Heugten – van der Kloet, 2015). It is unclear if sleep problems in the PNES population are associated with the frequency of seizures.

There are several gaps in the literature because there has been very little research on the relationship between sleep and other outcome measures commonly recorded in PNES research. Correlations with somatic symptoms, anxiety, depression, and functional symptoms are limited to single studies. Sleep's relationship to seizure frequency, illness perceptions, stress, coping, and disability status have been unexplored. The evidence on the relationship between sleep disturbance and QOL is conflicting and hampered by small sample sizes. It is important to understand the relationship between sleep and QOL in people with PNES, as sleep is modifiable health behavior, and when treated can improve QOL (Mukherjee et al., 2015).

There has been little research on QOL and seizure frequency in the context of sleep problems in the PNES population. My long-term goal is to improve QOL in people with PNES by expanding treatment options to address the different domains of QOL. To reach this goal, an in-depth understanding of factors affecting QOL is needed. There is vast research on the psychological and interpersonal factors that are known correlates of QOL in PNES. However, there is a paucity of research on sleep quality in PNES and its relationship to QOL, and to our knowledge no evidence on the relationship between sleep quality and seizure frequency. Therefore, the objectives of this dissertation research were threefold: to generate a conceptual definition of QOL in PNES; to evaluate the current nonpharmacologic PNES treatments and effects on seizure frequency and QOL; and explore the relationship between sleep quality, QOL, and seizure frequency in patients with PNES.

Aim one was to define QOL in the PNES population through concept analysis. Aim two was to examine and synthesize the current literature on the effect of nonpharmacologic interventions in relation to seizure frequency and QOL in people with PNES. Aim 3 was to explore the relationships between sleep quality, QOL, and seizure frequency in people with

PNES, with a secondary aim of identifying physiological, psychological, and situational factors associated with QOL and seizure frequency.

References

Anderson, K. N., & Bradley, A. J. (2013). Sleep disturbance in mental health problems and neurodivergent disease. *Nature and Science of Sleep, 5*, 61-75. https://doi.org/10.2147/nss.s34842

Asadi-Pooya, A. A., & Bahrami, Z. (2019). Frequency of attacks in patients with psychogenic non-epileptic seizures. *Epileptic Disorders, 21*(4), 371-374. https://doi.org/10.1684/epd.2019.1077

Baslet, G., Seshadri, A., Bermeo-Ovalle, A., Willment, K., & Myers, L. (2016). Psychogenic non-epileptic seizures: An updated primer. *Psychosomatics, 57*(1), 1-17. https://doi.org/10.1016/j.psym.2015.10.004

Centers for Disease Control and Prevention. (2022a). *About our program: Sleep and sleep disorders*. https://www.cdc.gov/sleep/about_us.html

Dopheide, J. A. (2020). Insomnia overview: Epidemiology, pathophysiology, diagnosis, monitoring, and nonpharmacologic therapy. *The American Journal of Managed Care, 26*, S76-S84. https://doi.org/10.37765/ajmc.2020.42769

Durrant, J., Rickards, H., & Cavanna, A. E. (2011). Prognosis and outcome predictors in psychogenic nonepileptic seizures. *Epilepsy Research and Treatment, 2011*, Article 274736. https://doi.org/10.1155/2011/274736

Erickson, J., Fan, J., Roth, H., Shin, H. W., Wabulya, A., Ngo, L., Hinn, A., & Vaughn, B. (2019). Sleep complaints in patients with psychogenic non-epileptic seizures. *SLEEP, 42*(1), A380. https://doi.org/10.1093/sleep/zsz067.943

Fang, R., & Li, X. (2015). A regular yoga intervention for staff nurse sleep quality and work stress: A randomised controlled trial. *Journal of Clinical Nursing, 24*(23-24), 3374–3379. https://doi.org/10.1111/jocn.12983

Garcia, P. (2020). Psychogenic nonepileptic seizures. *UpToDate*. Retrieved October 20, 2020, from https://www.uptodate.com/contents/psychogenic-nonepileptic-seizures

Grandner, M. A., Jackson, N. J., Pigeon, W. R., Gooneratne, N. S., & Patel, N. P. (2012). State and regional prevalence of sleep disturbance and daytime fatigue. *Journal of Clinical Sleep Medicine, 8*(1), 77-86F. https://doi.org/10.5664/jcsm.1668

Graham, C. D., & Kyle, S. D. (2017). A preliminary investigation of sleep quality in functional neurological disorders: Poor sleep appears common, and is associated with functional impairment. *Journal of the Neurological Sciences, 378*, 163-166. http://dx.doi.org/10.1016/j.jns.2017.05.021

Hamilton, D. F., Giesinger, J. M., & Giesinger, K. (2017). It is merely subjective opinion that patient-reported outcomes are not objective tools. *Bone & Joint Research, 6*(12), 665-666. https://dx.doi.org/10.1302%2F2046-3758.612.BJR-2017-0347

Jennum, P., Ibsen, R., & Kjellberg, J. (2019). Morbidity and mortality of nonepileptic seizures (NES): A controlled national study. *Epilepsy & Behavior, 96*, 229-233. https://doi.org/10.1016/j.yebeh.2019.03.016

Jones, B., Reuber, M., & Norman, P. (2016). Correlates of health-related quality of life in adults with psychogenic nonepileptic seizures: A systematic review. *Epilepsia, 57*(2), 171-181. https://doi.org/10.1111/epi.13268

Kanner, A. M. (2003). Depression in epilepsy: A frequently neglected multifaceted disorder. *Epilepsy & Behavior, 4*, S11-S19. https://doi.org/10.1016/j.yebeh.2003.10.004

Kyle, S. D., Morgan, K., & Espie, C. A. (2010). Insomnia and health-related quality of life. *Sleep Medicine Reviews, 14*, 69-82. https://doi.org/10.1016/j.smrv.2009.07.004

LaFrance, W. C., Jr., Ranieri, R., & Blum, A. S. (2016). Nonepileptic seizures – Objective phenomena. In M. Hallett, J. Stone, & A. Carson (Eds.), *Handbook of clinical neurology: Vol.139. Functional neurologic disorders* (3rd ed., pp. 297-304). Elsevier. http://dx.doi.org/10.1016/B978-0-12-801772-2.00026-6

Latreille, V., Baslet, G., Sarkis, R., Pavlova, M., & Dworetzky, B. A. (2018). Sleep in psychogenic nonepileptic seizures: Time to raise a red flag. *Epilepsy & Behavior, 86*, 6-8. https://doi.org/10.1016/j.yebeh.2018.07.001

Latreille, V., Dworetzky, B. A., Baslet, G., & Pavlova, M. (2019). Sleep disturbances in patients with psychogenic non-epileptic seizures: Is it all subjective? A prospective pilot study of sleep-wake patterns. *Seizure, 65*, 124-128. https://doi.org/10.1016/j.seizure.2019.01.016

Medic, G., Wille, M., & Hemels, M. (2017). Short- and long-term health consequences of sleep disruption. *Nature and Science of Sleep, 9*, 151–161. https://doi.org/10.2147/nss.s134864

Mukherjee, S., Patel, S. R., Kales, S. N., Ayas, N. T., Strohl, K. P., Gozal, D., & Malhotra, A. (2015). An official American Thoracic Society statement: The importance of health sleep. Recommendations and future priorities. *American Journal of Respiratory and Critical Care Medicine, 191*(12), 1450-1458. https://doi.org/10.1164/rccm.201504-0767ST

National Heart, Lung, and Blood Institute. (2011). *Your guide to healthy sleep*. U.S. Department of Health and Human Services, National Institutes of Health. https://www.nhlbi.nih.gov/files/docs/public/sleep/healthy_sleep.pdf

Ohayon, M. M. (2011). Epidemiological overview or sleep disorders in the general population. *Sleep Medicine Research, 2*(1), 1-9. https://doi.org/10.17241/smr.2011.2.1.1

Perez, D. L., & LaFrance, W. C., Jr. (2016). Nonepileptic seizures: An updated review. *CNS Spectrums, 21*(3), 239-246. https://dx.doi.org/10.1017%2FS109285291600002X

Pick, S., Anderson, D. G., Asadi-Pooya, A. A., Aybek, S., Baslet, G., Bloem, B. R., Bradley-Westguard, A., Brown, R. J., Carson, A. J., Chalder, T., Damianova, M., David, A. S., Edwards, M. J., Epstein, S. A., Espay, A. J., Garcin, B., Goldstein, L. H., Hallett, M., Jankovic, J., … Nicholson, T. R. (2020). Outcome measurement in functional neurological disorder: A systematic review and recommendations. *Journal of Neurology, Neurosurgery and Psychiatry, 91*(6), 638–649. https://doi.org/10.1136/jnnp-2019-322180

Plummer, M., & Molzahn, A. E. (2009). Quality of life in contemporary nursing theory: A concept analysis. *Nursing Science Quarterly, 22*(2), 134-140. https://doi.org/10.1177%2F0894318409332807

Popkirov, S., Asadi-Pooya, A. A., Duncan, R., Gigineishvili, D., Hingray, C., Kanner, A. M., LaFrance, W. C., Jr., Pretorius, C., & Reuber, M. (2019). The aetiology of psychogenic non-epileptic seizures: risk factors and comorbidities. *Epileptic Disorders, 21*(6), 529–547. https://doi.org/10.1684/epd.2019.1107

Pretorius, C., & Sparrow, M. (2015). Life after being diagnosed with psychogenic non-epileptic seizures (PNES): A South African perspective. *Seizure, 30*, 32-41. https://doi.org/10.1016/j.seizure.2015.05.008

Reuber, M., Mitchell, A. J., Howlett, S., & Elger, C. E. (2005). Measuring outcome in psychogenic nonepileptic seizures: How relevant is seizure remission? *Epilepsia, 46*(11), 1788-1795. https://doi.org/10.1111/j.1528-1167.2005.00280.x

Revicki, D. A., Osoba, D., Fairclough, D., Barofsky, I., Berzon, R., Leidy, N. K., & Rothman, M. (2000). Recommendations on health-related quality of life research to support labeling and promotional claims in the United States. *Quality of Life Research, 9*(8), 887–900. https://doi.org/10.1023/A:1008996223999

Robson, C., Myers, L., Pretorius, C., Lian, O. S., & Reuber, M. (2018). Health related quality of life of people with non-epileptic seizures: The role of socio-demographic characteristics and stigma. *Seizure, 55*, 93-99. https://doi.org/10.1016/j.seizure.2018.01.001

Sutton, E. L. (2014). Psychiatric disorders and sleep issues. *Medical Clinics of North America, 98*(5), 1123-1143. https://doi-org.proxy.lib.utk.edu/10.1016/j.mcna.2014.06.009

Szaflarski, J. P., & Szaflarski, M. (2004). Seizure disorders, depression, and health-related quality of life. *Epilepsy & Behavior, 5*(1), 50-57. https://doi.org/10.1016/j.yebeh.2003.10.015

Trockel, M., Manber, R., Chang, V., Thurston, A., & Tailor, C. (2011). An e-mail delivered

CBT for sleep-health program for college students: Effects on sleep quality and depression symptoms. *Journal of Clinical Sleep Medicine, 7*(3), 276–281. https://doi.org/10.5664/jcsm.1072

Van Heugten – van der Kloet, D., Giesbrecht, T., & Merckelbach, H. (2015). Sleep loss increases dissociation and affects memory for emotional stimuli. *Journal of Behavior Therapy and Experimental Psychiatry, 47*, 9-17. http://dx.doi.org/10.1016/j.jbtep.2014.11.002

Varricchio, C. G. (1990). Relevance of quality of life to clinical nursing practice. *Seminars in Oncology Nursing, 6*(4), 255-259. https://doi.org/10.1016/0749-2081(90)90027-3

Wickwire, E. M., Tom, S. E., Scharf, S. M., Vadlamani, A., Bulatao, I. G., & Albrecht, J. S. (2019). Untreated insomnia increases all-cause health care utilization and costs among Medicare beneficiaries. *Sleep, 42*(4), Article zsz007. https://doi.org/10.1093/sleep/zsz007

Wilkins, S. S., Mesraoua, B., Palomo, G. A., Al Hail, H., Salam, A., Melikyan, G., Azar, N., Haddad, N., Uthman, B., Siddiqi, M., Elsheikh, L., Ali, M., Alrabi, A., Shuaib, A., Deleu, D., & Asadi-Pooya, A. A. (2018). Characteristics of patients with confirmed epilepsy and psychogenic nonepileptic seizures in Qatar. *Epilepsy & Behavior, 85*, 218-221. https://doi.org/10.1016/j.yebeh.2018.06.014

Wiseman, H., Mercer, G., Martin, R. C., & Reuber, M. (2018). Health-related quality of life: Utility and limitations in patients with psychogenic nonepileptic seizures. In W. C. Lafrance, Jr., & S. C. Schachter (Eds.), *Gates and Rowan's nonepileptic seizures* (4th ed., pp. 165-177). Cambridge University Press.

Yeom, J. S., Bernard, H., & Koh, S. (2021). Myths and truths about pediatric psychogenic nonepileptic seizures. *Clinical and Experimental Pediatrics, 64*(6), 251-259. https://doi.org/10.3345/cep.2020.00892

Zhang, Y.-C., Bromfield, E. B., Hurwitz, S., Nelson, A., & Sylvia, K. (2009). Comparison of outcomes of video/EEG monitoring between patients with epileptic seizures and those with psychogenic nonepileptic seizures. *Epilepsy & Behavior, 15*(3), 303-307. https://doi.org/10.1016/j.yebeh.2009.04.008

Chapter II: Quality of Life in Psychogenic Nonepileptic Seizures: An Evolutionary Concept Analysis

This manuscript (Scholarly Paper #1) was published in *Issues in Mental Health Nursing*. The manuscript in this dissertation is unchanged from the published version, except for the renumbering of tables to fit the required dissertation format. Sandra Cobb performed the literature review, developed the concepts, and wrote the manuscript. Dr. Lora Beebe offered guidance in manuscript preparation, provided feedback on concept development, and made editorial changes.

Cobb, S. J., & Beebe, L. H. (2022). Quality of Life in Psychogenic Nonepileptic Seizures: An Evolutionary Concept Analysis. *Issues in Mental Health Nursing*, 43(8), 730-736. https://doi.org/10.1080/01612840.2022.2035026

Abstract

Psychogenic nonepileptic seizures (PNES) pose a serious threat to quality of life (QOL) in patients who battle the disorder. As psychological treatment options have progressed, improvement in QOL has become a more common desired outcome. Despite its relevance in PNES research and treatment, QOL has not been defined in the PNES population. Rodgers' Evolutionary Method of concept analysis was used to analyze 47 articles and clarify the concept of QOL in PNES. QOL in PNES is subjective, multidimensional, associated with symptoms, and dynamic in nature. This conceptualization of QOL in PNES may be useful in future PNES research and treatment.

Psychogenic nonepileptic seizures (PNES) are events that have the physical manifestations of epileptic seizures without corresponding electroencephalographic (EEG) changes (Baslet et al., 2016). PNES has been described as a neuropsychiatric, conversion, somatic symptom, or functional neurological disorder (Cretton et al., 2020). The estimated prevalence of PNES is 2 to 33 per 100,000, and 20-50% of patients who are referred to epilepsy monitoring units receive a diagnosis of PNES (Benbadis & Allen Hauser, 2000). PNES is often confused for epilepsy due to the physical manifestations of the disorder.

PNES diagnosis and treatment are challenging to both patients and providers. Stigma, lack of information, and lack of access to diagnostic services and specialist expertise make it difficult for patients to receive the proper diagnosis and treatment (Hingray et al., 2018). Healthcare providers report uncertainty in the diagnosis and management of PNES (Barnett et al., 2020). Patients with PNES are frequently misdiagnosed with epilepsy, leading to multiple unnecessary antiepileptic drugs trials and increased healthcare costs (Baslet et al., 2016). Despite overwhelming evidence that PNES is a legitimate disorder, many healthcare workers believe patients with PNES are malingering (Barnett et al., 2020). These factors force patients with PNES to navigate a healthcare system that is not conducive to recovery, and delays receiving the neurological and mental health services needed to manage PNES. These are just a few factors that may negatively impact quality of life (QOL) in persons with PNES.

The concept of QOL became popular in American culture in the 1960s (Meeberg, 1993). As medical technology advanced and life-sustaining and life-extending treatments proliferated, it became clear that quality is just as important as quantity of life (Meeberg, 1993). Clinical outcomes are increasingly assessed using subjective measures rather than objective ones, as is the case with QOL as a patient-reported outcome measure related to health promotion and restoration of function (Moons et al., 2006). Most definitions of QOL are based on a person’s satisfaction with life (Moons et al., 2006). The World Health Organization Quality of Life (WHOQOL) Group (1995) defined QOL as “an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns" (p. 1405). The concept of QOL has been thoroughly explored by many researchers in various disciplines. QOL can be interpreted differently by patient populations according to their disease process and life circumstances (Dignani et al., 2014). There is a large body of research showing decreased QOL in patients with PNES; however, the concept of the QOL has not been explored in this population. The purpose of this analysis is to explore the concept of QOL in the context of PNES.

Method

A concept is a label used to summarize the essence of a phenomenon or to represent the reality of an idea (Morse, 2017). The Evolutionary Method of concept analysis (Rodgers, 2000) was used to explore QOL in PNES. The evolutionary method is systematic and focuses on the dynamic nature of concepts. Because QOL can vary depending on a person's state of mind and personal philosophies, this method of analysis is ideal for exploring QOL in the context of PNES. A strength of this analytical method is its emphasis on including multiple disciplines in the search for concept clarification. The steps of Rodgers' (2000) evolutionary method of concept analysis include identifying the concept of interest and surrogate terms; selecting the setting and sample for data collection; collecting data relevant to identify attributes and contextual basis; analyzing data regarding the concept; identifying an exemplar, if appropriate; and identifying implications, hypotheses, and implications for further development (p. 85).

An electronic literature review was performed using PubMed, PsycINFO, and the Cumulative Index to Nursing and Allied Health Literature (CINAHL). The terms "quality of life" and "psychogenic nonepileptic seizures" were entered into both databases. The search was limited to articles published between 2011 and 2021 in order to produce a manageable amount of literature for review, and to produce articles with current views of the QOL and PNES. The search was also limited to articles that were written in English and with adult patient populations.

The search produced 154 articles for review, 107 of which were eliminated due to (a) no measurement of quality of life, or (b) no data on patients with PNES. The remaining 47 articles were carefully read, and themes from each were categorized into surrogate terms, attributes, antecedents, and consequences.

Findings

Surrogate Terms

Surrogate terms are expressions of the concept that are worded differently than the search terms used in this study (Rodgers, 2000). Health-related quality of life (HRQOL) was frequently mentioned in the literature reviewed for this analysis. While none of the articles defined HRQOL, the concept can be viewed as a more concise term to describe QOL in relation to a person's health status. The terms "QOL" and "HRQOL" appear to be used interchangeably in the context of PNES research.

Attributes

Attributes are the characteristics of the concept (Rodgers, 2000). After a thorough review of the literature, four attributes were identified: (a) subjective, (b) multidimensional, (c) associated with symptoms, and (d) dynamic (Table 2.1). The first attribute is that QOL in PNES is subjective and related to the individual's perception of self, illness, and others. Perception is the way the patients view, understand, and assign meaning to concepts in their lives. A person's perspective changes based on informational input. While QOL can vary greatly from person to person based on self-evaluation of perceptions, those with PNES consistently report poor QOL, especially when compared to those with epilepsy (Baslet et al., 2016). Patients with PNES perceive their condition as threatening and may attribute symptoms to physical and/or psychological causes. The perception of greater personal control over PNES is associated with better QOL, but patients with PNES often report an external locus of control (Rawlings, Brown, & Reuber, 2017b). Perceptions are influenced by online representation of PNES, where patients can find support or misinformation related to PNES. The stigma associated with PNES can impact patients' perceptions of self-control (Rawlings, Brown, & Reuber, 2017a) and can influence overall QOL scores (Karakis et al., 2020). Other's perceptions related to the etiology, locus of control, and chronicity of PNES perpetuates stigma (Rawlings, Brown, Stone, & Reuber, 2017). Healthcare workers often have perceptions of PNES that are misaligned with the current research (Worsley et al., 2011) and can be damaging to the patient-provider relationship.

The second attribute of QOL in PNES is that it is multidimensional. Dimensions include role function and psychological functioning. Role function is a significant element of QOL in patients with PNES. Role function is a dynamic process that can change the patient's perception of QOL quickly depending on their functional status. Recurrent themes related to role function in the literature include problems with employment, disability, and family and social functioning. Regarding psychological function, recurrent themes included emotional processing and coping strategies. Appropriate emotional processing is vital to QOL in the presence of PNES. Abnormal emotional processing may lead to behavior disturbances, avoidance, and continued psychological disorders (Novakova et al., 2015). Of particular importance is coping strategy. According to Lazarus and Folkman (1984), a person can either take part in problem-focused coping or emotion-focused coping. Patients with PNES tend to partake in escape-avoidance (emotion-focused) coping that is associated with poor QOL, but confrontive (problem-focused) coping is a positive predictor of QOL in PNES (Cronje & Pretorius, 2013).

The third attribute of QOL in PNES is that it is associated with seizure, somatic, and psychological symptoms. Seizure-specific symptoms include seizure worry, seizures frequency, and seizure freedom. While seizure-specific symptoms affect QOL less than other factors in people with PNES, they still contribute to QOL in this population. Seizure worry represents the patient's concerns with the unpredictability of PNES. Seizure frequency is usually not associated with QOL in PNES (Jones et al., 2016). However, if seizure frequency is conceptualized as a recurring somatic symptom, patients may associate it with QOL. Attaining seizure freedom is associated with better QOL in patients with PNES (Walther et al., 2019, 2020). Patients with PNES often experience recurring somatic symptoms such as pain, insomnia, fatigue (Jones et al., 2016). These symptoms significantly hinder physical functioning and other QOL domains. Psychological health is an important indicator of QOL. In PNES, QOL is correlated with depression, anxiety, alexithymia, dissociation, anger, and distress (Jones et al., 2016). Depression is the most strongly correlated psychiatric diagnosis with PNES (Jones et al., 2016).

The fourth attribute is that QOL is dynamic in nature for patients with PNES. QOL changes based on the physical, social, and temporal contexts in which it is measured. There is strong evidence that changes in QOL in PNES are related to patient or the healthcare provider actions. The person with PNES takes the first action by seeking help from a healthcare provider. The healthcare provider guides the patient to the appropriate therapy. It is then up to the patient to attend and adhere to therapy. Cognitive behavioral- and mindfulness-based therapies can improve QOL in patients with PNES (Lanzillotti et al., 2021; Wiseman et al., 2018). It is a daily effort for patients with PNES to take action toward modulating their symptoms and improving their prognosis.

Antecedents

Antecedents are events that occur before the concept (Rodgers, 2000), and are shown in Table 2.2. Three categories of antecedents were identified: (a) the ability to assess QOL, (b) sociodemographic factors, and (c) personal history. QOL measurements tools must exist for researchers to quantify QOL. Many QOL instruments are used in the PNES population, including the Quality of Life in Epilepsy (QOLIE) survey, but none have been validated for use in the PNES population (Wiseman et al., 2018).

Despite the consensus that the PNES population is a heterogenous group (Wiseman et al., 2018), there are some commonalities found in many patients. The PNES population largely consists of females who experienced PNES onset in early or middle adulthood (Nemade et al., 2020). Some attributes of QOL in PNES such as depression, anxiety, and somatic symptoms are more common in women (Dworetzky & Baslet, 2017). Older age at PNES onset has been associated with poor QOL in people with PNES (Gagny et al., 2021; Myers et al., 2012; Strutt et al., 2011). Problems in interpersonal relationships with family members, caregivers, peers, and healthcare workers are common in patients with PNES (Popkirov et al., 2019). These interpersonal relationships are part of the patient's delicate social network. Patients with PNES who contend with problems in interpersonal relationships are more likely to have decreased QOL (LaFrance et al. 2011) and higher levels of anxiety and depression (Green et al., 2017).

The patient's personal history is important because past events affect the formation of patient conditions. Up to 90% of patients with PNES report a history of trauma, particularly in childhood (Myers et al., 2013). Such critical life events can cause posttraumatic stress disorder (PTSD) and significant changes in the patient's personality, emotional state, and QOL. Comorbid epilepsy and psychiatric conditions are also common in PNES (Kutlubaev et al., 2018). These can occur before the development of the disorder, then become exacerbated in the context of PNES. Pathophysiological anomalies in PNES include structural brain abnormalities as seen on magnetic resonance imaging (MRI) scans (Asadi-Pooya & Homayoun, 2020) and abnormal biochemical biomarkers (Winterdahl et al., 2017).

Consequences

Consequences are events that occur as a result of the concept (Rodgers, 2000) and are shown in Table 2.3. Consequences are related to therapeutic goals and outcomes and health and wellness. QOL is frequently cited as a primary or secondary outcome in PNES research (Pick et al., 2020) and assessing QOL is viewed as a way to measure the impact of PNES. Due to the multidimensionality of QOL, objective outcome measures can provide the researcher with a more comprehensive view of the patient's life and progress. Treatments for PNES are now beginning to focus on correlates of QOL (e.g., depression, dissociation, coping strategies, etc.) rather than seizure frequency alone (Lanzillotti et al., 2021).

Health and wellness are likely to be defined differently person-to-person, but can generally be thought of as sense of well-being. The consequences of QOL reflect the impact of positive of negative factors in the patient’s life. As a patient progresses through stages of the PNES disease process and treatment, improvements in attributes lead to changes in disease state and functional abilities, thereby increasing QOL (Goldstein et al., 2020). Persons with PNES strive for “a normal life,” which generally means living a life free of the effects of PNES.

Discussion

This concept analysis using Rodger’s evolutionary method was aimed at investigating the concept of QOL in the context of PNES. As with most concepts, QOL is dynamic, and its definition may change over time as knowledge of PNES and attributes of QOL grows. Quality of life has been defined numerous times as a generalizable term, but it has never been developed in the context of PNES. Establishing QOL specific to this patient population is a vital part of advancing the nurse’s role in future development and research.

This concept analysis has helped define the surrogate terms, antecedents, attributes, and consequences of QOL within the context of PNES. Patients with PNES have unique factors in their lives that are not always reflected in conventional definitions of QOL. This analysis revealed unique aspects of the lives of this patient population that define QOL as being subjective, multidimensional, associated with symptoms, and dynamic. Revealing these components of QOL in PNES is the first step in developing the foundational knowledge needed to perform meaningful research in the future. In light of the antecedents, attributes, and consequences identified in this review, the following definition is proposed: QOL in patients with PNES is a subjective and dynamic feeling of well-being and satisfaction with life based on the person’s lived experiences, perceptions of life, and abilities to manage PNES.

Implications in Nursing

This concept analysis revealed factors of QOL that are specific to patients with PNES. For example, aside from epilepsy, the attribute of QOL being associated with seizure and somatic symptoms is not present in other patient populations or conceptualizations of QOL. It is important to understand the patients for whom we are providing care. Understanding their values and beliefs is an essential component of patient-centered care. Quality of life is a very broad and general term, so it is necessary to narrow our focus on the aspects of QOL that affect our patient population directly.

The majority of PNES research is performed by physicians and psychologists. In this review, none of the reviewed studies on PNES were led by nurse researchers or published in nursing journals. This may lead to nurses' lack of understanding and acceptance of PNES, as 30-50% of neuroscience nurses believe patients with PNES are faking their seizures (Wojda, 2021). More research from the nursing perspective may help further our understanding of QOL in PNES. Additionally, research on sociodemographic characteristics in the PNES population is limited (Szaflarski et al., 2018), and their relation to QOL in PNES is poorly understood. While many studies report sociodemographic characteristics of the PNES population, future research should aim to understand how these characteristics are associated with outcomes like QOL.

The results of this concept analysis may be most useful in examining the instruments used to measure QOL in patients with PNES. Currently, the most frequently used instrument to measure QOL in PNES is the QOLIE questionnaire (Jones et. al., 2016). Since the QOLIE questionnaire was developed specifically to measure QOL in the presence of epilepsy, the category "medication side effects" is included to measure the effects of antiepileptic drugs. Patients with PNES are usually only prescribed antiepileptic drugs when they have been misdiagnosed with epilepsy or in the presence of comorbid epilepsy. Therefore, medication side effects were not identified in this analysis as a factor in QOL. Further, the QOLIE lacks questions addressing several important psychological symptoms associated with QOL in PNES such as alexithymia, dissociation, and anger. This analysis may prove useful in developing an instrument that is more suited to measure QOL based on factors specific to PNES.

Perhaps most importantly, this analysis serves to highlight the multidimensional nature of QOL in PNES. It is important for nurses to realize that health promotion practices should be individualized in order to address the multifaceted nature of QOL. It is easy to focus on one aspect of the patient’s care plan and forget to address other important factors.

References

Asadi-Pooya, A. A., & Homayoun, M. (2020). Structural brain abnormalities in patients with psychogenic nonepileptic seizures. *Neurological Sciences, 41*(3), 555-559. https://doi.org/10.1007/s10072-019-04108-7

Barnett, C., Davis, R., Mitchell, C., & Tyson, S. (2020). The vicious cycle of functional neurological disorders: a synthesis of healthcare professionals' views on working with patients with functional neurological disorder. *Disability and Rehabilitation*, Advance online publication. https://doi.org/10.1080/09638288.2020.1822935

Baslet, G., Ehlert, A., Oser, M., & Dworetzky, B. A. (2020). Mindfulness-based therapy for psychogenic nonepileptic seizures. *Epilepsy & Behavior, 103*(Part A), 106534. https://doi.org/10.1016/j.yebeh.2019.106534

Baslet, G., Seshadri, A., Bermeo-Ovalle, A., Willment, K., & Myers, L. (2016). Psychogenic non-epileptic seizures: An updated primer. *Psychosomatics, 57*(1), 1-17. https://doi.org/10.1016/j.psym.2015.10.004

Benbadis, S. R., & Allen Hauser, W. (2000). An estimate of the prevalence of psychogenic non-epileptic seizures. *Seizure, 9*(4), 280-281. https://doi.org/10.1053/seiz.2000.0409

Boesten, N., Myers, L., & Wijnen, B. (2019). Quality of life and psychological dysfunction in traumatized and nontraumatized patients with psychogenic nonepileptic seizures (PNES). *Epilepsy & Behavior, 92*, 341-344. https://doi.org/10.1016/j.yebeh.2019.01.024

Conwill, M., Oakley, L., Evans, K., & Cavanna, A. E. (2014). CBT-based group therapy intervention for nonepileptic attacks and other functional neurological symptoms: A pilot study. *Epilepsy & Behavior, 34*, 68-72. https://doi.org/10.1016/j.yebeh.2014.03.012

Cretton, A., Brown, R. J., LaFrance, W. C., Jr., & Aybek, S. (2020). What does neuroscience tell us about the conversion model of functional neurological disorders? *The Journal of Neuropsychiatry and Clinical Neurosciences, 32*(1), 24-32. https://doi.org/10.1176/appi.neuropsych.19040089

Cronje, G., & Pretorius, C. (2013). The coping styles and health-related quality of life of South African patients with psychogenic nonepileptic seizures. *Epilepsy & Behavior, 29*(3), 581-584. https://doi.org/10.1016/j.yebeh.2013.09.045

Dagar, A., & Falcone, T. (2019). Pins and PNES: Systematic content analysis of Pinterest for information on psychogenic nonepileptic seizures (PNES). *Epilepsy & Behavior, 93*, 129-132. https://doi.org/10.1016/j.yebeh.2019.01.020

De Barros, A. C. S., Romano Furlan, A. E., Neves Marques, L. H., & De Araújo Filho, G. M. (2018). Effects of a psychotherapeutic group intervention in patients with refractory mesial temporal lobe epilepsy and comorbid psychogenic nonepileptic seizures: A nonrandomized controlled study. *Seizure, 58*, 22-28. https://doi.org/10.1016/j.seizure.2018.03.023

Dignani, L., Toccaceli, A., Guarinoni, M. G., Petrucci, C., & Lancia, L. (2014). Quality of life in chronic obstructive pulmonary disease: An evolutionary concept analysis. *Nursing Forum, 50*(3), 201-213. https://doi.org/10.1111/nuf.12110

Drane, D. L., LaRoche, S. M., Ganesh, G. A., Teagarden, D., & Loring, D. W. (2016). A standardized diagnostic approach and ongoing feedback improves outcome in psychogenic nonepileptic seizures. *Epilepsy & Behavior, 54*, 34-39. https://doi.org/10.1016/j.yebeh.2015.10.026

Dworetzky, B. A., & Baslet, G. (2017). Psychogenic nonepileptic seizures in women. *Seminars in Neurology, 37*(6), 624-631. https://doi.org/10.1055/s-0037-1607971

Fairclough, G., Fox, J., Mercer, G., Reuber, M., & Brown, R. J. (2014). Understanding the perceived treatment needs of patients with psychogenic nonepileptic seizures. *Epilepsy & Behavior, 31*, 295-303. https://doi.org/10.1016/j.yebeh.2013.10.025

Gagny, M., Grenevald, L., El-Hage, W., Chrusciel, J., Sanchez, S., Schwan, R., Klemina, I., Biberon, J., de Toffel, B., Thiriaux, A., Visseaux, J. F., Martin, M. L., Meyer, M., Maillard, L., & Hingray, C. (2021). Explanatory factors of quality of life in psychogenic non-epileptic seizure. *Seizure, 84*, 6-13. https://doi.org/10.1016/j.seizure.2020.10.028

Garcia, C. R., Khan, G. Q., Morrow, A. M., Yadav, P., Lightner, D. D., Gilliam, F. G., & Villano, J. L. (2018). Brain tumors associated with psychogenic non-epileptic seizures: Case series. *Clinical Neurology and Neurosurgery, 164*, 53-56. https://doi.org/10.1016/j.clineuro.2017.11.013

Goldstein, L. H., Robinson, E. J., Mellers, J. D. C., Stone, J., Carson, A., Reuber, M., Meford, N., McCrone, P., Murray, J., Richardson, M. P., Pilecka, I., Eastwood, C., Moore, M., Mosweu, I., Perdue, I., Landau, S., & Chalder, T. (2020). Cognitive behavioural therapy for adults with dissociative seizures (CODES): A pragmatic, multicentre, randomized controlled trial. *The Lancet Psychiatry, 7*(6), 491-505. https://doi.org/10.1016/s2215-0366(20)30128-0

Green, B., Norman, P., & Reuber, M. (2017). Attachment style, relationship quality, and psychological distress in patients with psychogenic non-epileptic seizures versus epilepsy. *Epilepsy & Behavior, 66*, 120-126. http://dx.doi.org/10.1016/j.yebeh.2016.10.015

Hingray, C., El-Hage, W., Duncan, R., Gigineishvili, D., Kanemoto, K., LaFrance, W. C., Jr., de Marinis, A., Paul, R., Pretorius, C., Téllez-Zenteno, J. F., Wiseman, H., & Reuber, M. (2018). Access to diagnostic and therapeutic facilities for psychogenic nonepileptic seizures: An international survey by the ILAE PNES Task Force. *Epilepsia, 59*(1), 203-214. https://doi.org/10.1111/epi.13952

Johnstone, B., Velakoulis, D., Yuan, C. Y., Ang, A., Steward, C., Desmond, P., & O'Brien, T. J. (2016). Early childhood trauma and hippocampal volumes in patients with epileptic and psychogenic seizures. *Epilepsy & Behavior, 64*(Part A), 180-185. https://doi.org/10.1016/j.yebeh.2016.09.015

Jones, B., Reuber, M., & Norman, P. (2016). Correlates of health-related quality of life in adults with psychogenic nonepileptic seizures: A systematic review. *Epilepsia, 57*(2), 171-181. https://doi.org/10.1111/epi.13268

Karakis, I., Janocko, N. J., Morton, M. L., Groover, O., Teagarden, D. L., Villarreal, H. K., Loring, D. W., & Drane, D. L. (2020). Stigma in psychogenic nonepileptic seizures. *Epilepsy & Behavior, 111*, 107269. https://doi.org/10.1016/j.yebeh.2020.107269

Karakis, I., Montouris, G. D., Piperidou, C., San Luciano, M., Meador, K. J., & Cole, A. J. (2014). Patient and caregiver quality of life in psychogenic non-epileptic seizures compared to epileptic seizures. *Seizure, 23*(1), 47-54. https://doi.org/10.1016/j.seizure.2013.09.011

Kutlubaev, M. A., Xu, Y., Hackett, M. L., & Stone, J. (2018). Dual diagnosis of epilepsy and psychogenic nonepileptic seizures: Systematic review and meta-analysis of frequency, correlates, and outcomes. *Epilepsy & Behavior, 89*, 70-78. https://doi.org/10.1016/j.yebeh.2018.10.010

LaFrance, W. C., Jr., Alosco, M. L., Davis, J. D., Tremont, G., Ryan, C. E., Keitner, G. I., Miller, I. W., & Blum, A. S. (2011). Impact of family functioning on quality of life in patients with psychogenic nonepileptic seizures versus epilepsy. *Epilepsia, 52*(2), 292-300. https://doi.org/10.1111/j.1528-1167.2010.02765.x

LaFrance, W. C., Jr., Baird, G. L., Barry, J. J., Blum, A. S., Webb, A. F., Keitner, G. I., Machan, J. T., Miller, I., Szaflarski, J. P., & NES Treatment Trial (NEST-T) Consortium. (2014). Multicenter pilot treatment trial for psychogenic nonepileptic seizures: a randomized clinical trial. *JAMA Psychiatry, 71*(9), 997-1005. https://doi.org/10.1001/jamapsychiatry.2014.817

LaFrance, W. C., Jr., Ho, W. L. N., Bhatla, A., Baird, G. L., Atalib, H. H., & Godleski, L. (2020). Treatment of psychogenic nonepileptic seizures (PNES) using video telehealth. *Epilepsia, 61*(11), 2572-2582. https://doi.org/10.1111/epi.16689

Lanzillotti, A. I., Sarudiansky, M., Lombardi, N. R., Korman, G. P., & D'Alessio, L. (2021). Updated review on the diagnosis and primary management of psychogenic nonepileptic seizure disorders. *Neuropsychiatric Disease and Treatment, 17*, 1825-1838. https://doi.org/10.2147/NDT.S286710

Latreille, V., Baslet, G., Sarkis, R., Pavlova, M., & Dworetzky, B. A. (2018). Sleep in psychogenic nonepileptic seizures: Time to raise a red flag. *Epilepsy & Behavior, 86*, 6-8. https://doi.org/10.1016/j.yebeh.2018.07.001

Latreille, V., Dworetzky, B. A., Baslet, G., & Pavlova, M. (2019). Sleep disturbance in patients with psychogenic non-epileptic seizures: Is it all subjective? A prospective pilot study of sleep-wake patterns. *Seizure, 65*, 124-128. https://doi.org/10.1016/j.seizure.2019.01.016

Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. Springer Publishing.

Meeberg, G. A. (1993). Quality of life: A concept analysis. *Journal of Advanced Nursing, 18*(1), 32-38. https://doi.org/10.1046/j.1365-2648.1993.18010032.x

Mitchell, J. W., Ali, F., & Cavanna, A. E. (2012). Dissociative experiences and quality of life in patients with non-epileptic attack disorder. *Epilepsy & Behavior, 25*(3), 307-312. https://doi.org/10.1016/j.yebeh.2012.08.022

Moons, P., Budts, W., & De Geest, S. (2006). Critique on the conceptualisation of quality of life: A review and evaluation of different conceptual approaches. *International Journal of Nursing Studies, 43*(7), 891-901. https://doi.org/10.1016/j.ijnurstu.2006.03.015

Morse, J. M. (2017). Orientation 101: Definitions and other essential extraneous notes. In J. M. Morse (Ed.), *Analyzing and conceptualizing the theoretical foundations of nursing* (pp. 67-75). Springer Publishing.

Myers, L., Jones, J., Boesten, N., & Lancman, M. (2016). Psychogenic non-epileptic seizures (PNES) on the internet: Online representation of the disorder and frequency of search terms. *Seizure, 40*, 114-122. https://doi.org/10.1016/j.seizure.2016.06.018

Myers, L., Lancman, M., Laban-Grant, O., Matzner, B., & Lancman, M. (2012). Psychogenic non-epileptic seizures: Predisposing factors to diminished quality of life. *Epilepsy & Behavior, 25*(3), 358-362. https://doi.org/10.1016/j.yebeh.2012.08.024

Myers, L., Perrine, K., Lancman, M., Fleming, M., & Lancman, M. (2013). Psychological trauma in patients with psychogenic nonepileptic seizures: Trauma characteristics and those who develop PTSD. *Epilepsy & Behavior, 28*(1), 121-126. http://dx.doi.org/10.1016/j.yebeh.2013.03.033

Myers, L., Trobliger, R., Bortnik, K., & Lancman, M. (2018). Are there gender differences in those diagnosed with psychogenic nonepileptic seizures? *Epilepsy & Behavior, 78*, 161-165. https://doi.org/10.1016/j.yebeh.2017.10.019

Nemade, D., Shivumar, V., Ferguson, P., Singh, J. & Shah, S. (2020). Psychosocial and physiologic characteristics of patients with non-epileptic events: A retrospective study. *Cureus, 12*(1), e6767. https://dx.doi.org/10.7759%2Fcureus.6767

Novakova, B., Howlett, S., Baker, R., & Reuber, M. (2015). Emotion processing and psychogenic non-epileptic seizures: A cross-sectional comparison of patients and healthy controls. *Seizure, 29*, 4-10. https://doi.org/10.1016/j.seizure.2015.03.007

Pick, S., Anderson, D. G., Asadi-Pooya, A. A., Aybek, S., Baslet, G., Bloem, B. R., Bradley-Westguard, A., Brown, R. J., Carson, A. J., Chalder, T., Damianova, M., David, A. S., Edwards, M. J., Epstein, S. A., Espay, A. J., Garcin, B., Goldstein, L. H., Hallett, M., Jankovic, J., … Nicholson, T. R. (2020). Outcome measurement in functional neurological disorder: A systematic review and recommendations. *Journal of Neurology, Neurosurgery and Psychiatry, 91*(6), 638–649. https://doi.org/10.1136/jnnp-2019-322180

Popkirov, S., Asadi-Pooya, A. A., Duncan, R., Gigineishvili, D., Hingray, C., Kanner, A. M., LaFrance, W. C., Jr., Pretorius, C., & Reuber, M. (2019). The aetiology of psychogenic non-epileptic seizures: Risk factors and comorbidities. *Epileptic Disorders, 21*(6), 529-547. https://doi.org/10.1684/epd.2019.1107

Pretorius, C., & Sparrow, M. (2015). Life after being diagnosed with psychogenic non-epileptic seizures (PNES): A South African perspective. *Seizure, 30*, 32-41. https://doi.org/10.1016/j.seizure.2015.05.008

Rawlings, G. H., Brown, I., & Reuber, M. (2017a). Deconstructing stigma in psychogenic nonepileptic seizures: An exploratory study. *Epilepsy & Behavior, 74*, 167-172. https://doi.org/10.1016/j.yebeh.2017.06.014

Rawlings, G. H., Brown, I., & Reuber, M. (2017b). Predictors of health-related quality of life in patients with epilepsy and psychogenic nonepileptic seizures. *Epilepsy & Behavior, 68*, 153-158. https://doi.org/10.1016/j.yebeh.2016.10.035

Rawlings, G. H., Brown, I., & Reuber, M. (2018). Narrative analysis of written accounts about living with epileptic or psychogenic nonepileptic seizures. *Seizure, 62*, 59-65. https://doi.org/10.1016/j.seizure.2018.09.022

Rawlings, G. H., Brown, I., Stone, B, & Reuber, M. (2017). Written accounts of living with psychogenic nonepileptic seizures: A thematic analysis. *Seizure, 50*, 83-91. http://dx.doi.org/10.1016/j.seizure.2017.06.006

Robson, C., Myers, L., Pretorius, C., Lian, O. S., & Reuber, M. (2018). Health related quality of life of people with non-epileptic seizures: The role of socio-demographic characteristics and stigma. *Seizure, 55*, 93-99. https://doi.org/10.1016/j.seizure.2018.01.001

Rodgers, B. L. (2000). Concept analysis: An evolutionary view. In B. L. Rodgers & K. A. Knafl (Eds.), *Concept development in nursing: Foundations, techniques, and applications* (2nd ed., pp. 77-102). Saunders.

Salinsky, M., Rutecki, P., Parko, K., Goy, E., Storzbach, D., Markwardt, S., Binder, L., & Joos, S. (2019). Health-related quality of life in veterans and epileptic and psychogenic nonepileptic seizures. *Epilepsy & Behavior, 94*, 72-77. https://doi.org/10.1016/j.yebeh.2019.02.010

Strutt, A. M., Hill, S. W., Scott, B. M., Uber-Zak, L., & Fogel, T. G. (2011). Motivation, psychopathology, locus of control, and quality of life in women with epileptic and nonepileptic seizures. *Epilepsy & Behavior, 22*(2), 279-284. https://doi.org/10.1016/j.yebeh.2011.06.020

Szaflarski, J. P., Szaflarski, M., & Hansen, B. (2018). Epidemiology and classification of nonepileptic seizures. In W. C. Lafrance, Jr., & S. C. Schachter (Eds.), *Gates and Rowan's nonepileptic seizures* (4th ed., pp.1-18). Cambridge University Press. https://doi.org/10.1017/9781316275450

The World Health Organization Quality of Life Group. (1995). The World Health Organization quality of life assessment (WHOQOL): Position paper from the World Health Organization. *Social Science & Medicine, 41*(10), 1403-1409. https://doi.org/10.1016/0277-9536(95)00112-k

Tolchin, B. Baslet, G., Suzuki, J., Martino, S., Blumenfeld, H., Hirsch, L. J., Altalib, H., & Dworetzky, B. A. (2019). Randomized controlled trial of motivational interviewing for psychogenic nonepileptic seizures. *Epilepsia, 60*(5), 986-995. https://doi.org/10.1111/epi.14728

Tolchin, B., Dworetzky, B. A., Martino, S., Blumenfeld, H., Hirsch, L. J., & Baslet, G. (2019). Adherence with psychotherapy and treatment outcomes for psychogenic nonepileptic seizures. *Neurology, 92*(7), e675-e679. https://doi.org/10.1212/wnl.0000000000006848

Uliaszek, A. A., Prensky, E., & Baslet, G. (2012). Emotion regulation profiles in psychogenic non-epileptic seizures. *Epilepsy & Behavior, 23*(3), 364-369. https://doi.org/10.1016/j.yebeh.2012.01.009

Vaidya-Mathur, U., Myers, L., Laban-Grant, O., Lancman, M., Lancman, M., & Jones, J. (2016). Socialization characteristics in patients with psychogenic nonepileptic seizures (PNES). *Epilepsy & Behavior, 56*, 59-65. https://doi.org/10.1016/j.yebeh.2015.12.032

Walther, K., Volbers, B., Erdmann, L., Kurzbuch, K., Lang, J. D., Mueller, T. M., Reindl, C., Schwarz, M., Schwab, S., & Hamer, H. M. (2020). Psychological long-term outcome in patients with psychogenic non-epileptic seizures. *Seizure, 83*, 187-192. https://doi.org/10.1016/j.seizure.2020.09.014

Walther, K., Volbers, B., Erdmann, L., Onugoren, M. D., Gollwitzer, S., Kasper, B. S., Kurzbuch, K., Lang, J., Scwab, S., Schwarz, M., & Hamer, H. M. (2019). Psychological long-term outcome in patients with psychogenic nonepileptic seizures. *Epilepsia, 60*(4), 669-678. https://doi.org/10.1111/epi.14682

Wardrope, A., Green, B., Norman, P., & Reuber, M. (2019). The influence of attachment style and relationship quality on quality of life and psychological distress in carers of people with epileptic and nonepileptic seizures. *Epilepsy & Behavior, 93*, 16-21. https://doi.org/10.1016/j.yebeh.2019.01.028

Whitehead, K., Kandler, R., & Reuber, M. (2013). Patients' and neurologists' perception of epilepsy and psychogenic nonepileptic seizures. *Epilepsia, 54*(4), 708-717. https://doi.org/10.1111/epi.12087

Winterdahl, M., Miani, A., Vercoe, M. J. H., Ciovica, A., Uber-Zak, L., Rask, C. U., & Zak, P. J. (2017). Vulnerability to psychogenic non-epileptic seizures is linked to low neuropeptide Y levels. *Stress, 20*(6), 589-597. https://doi.org/10.1080/10253890.2017.1378638

Wiseman, H., Mercer, G., Martin, R. C., & Reuber, M. (2018). Health-related quality of life: Utility and limitations in patients with psychogenic nonepileptic seizures. In W. C. LaFrance, Jr., & S. C. Schachter (Eds.), *Gates and Rowan's nonepileptic seizures* (4th ed., pp. 165-177). Cambridge University Press.

Wojda, P. (2021). Nursing a patient with nonepileptic seizures – Case report. *The Journal of Neurological and Neurosurgical Nursing, 10*(1), 35-41. https://doi.org/10.15225/PNN.2021.10.1.5

Wolf, L. D., Hentz, J. G., Ziemba, K. S., Kirlin, K. A., Noe, K. H., Hoerth, M. T., Crepeau, A.

Z., Sirven, J. I., Drazkowski, J. F., & Locke, D. E. C. (2015). Quality of life in psychogenic nonepileptic seizures and epilepsy: The role of somatization and alexithymia. *Epilepsy & Behavior, 43*, 81-88. https://doi.org/10.1016/j.yebeh.2014.12.010

Worsley, C., Whitehead, K., Kandler, R., & Reuber, M. (2011). Illness perceptions of health care workers in relation to epileptic and psychogenic nonepileptic seizures. *Epilepsy & Behavior, 20*(4), 668-673. https://doi.org/10.1016/j.yebeh.2011.01.029

Table 2.1: Attributes

Attribute	References
Subjective – related to perceptions of self, illness, and others	
Illness perception	Rawlings, Brown, & Reuber, 2017b, 2018
Healthcare workers' perception of PNES	Rawlings et al., 2018a; Whitehead, Kandler, & Reuber, 2013; Worsley, Whitehead, Kandler, & Reuber, 2011
Online representation of PNES	Dagar & Falcone, 2019; Myers, Jones, Boesten, & Lancman, 2016; Vaidya-Mathur et al., 2016
Stigma	Karakis et al., 2020; Rawlings et al., 2017a; Robson, Myers, Pretorius, Lian, & Reuber, 2018
Locus of control	Rawlings et al., 2017b; Strutt, Hill, Scott, Uber-Zak, & Fogel, 2011
Multidimensional – Related to role and psychological functioning	
Employment	Robson et al., 2018; Salinsky et al., 2019
Disability	Rawlings et al., 2018; Robson et al., 2018; Wolf et al., 2015
Family functioning	LaFrance et al., 2011
Social functioning	Karakis et al., 2014; Myers, Lancman, Laban-Grant, Matzner, & Lancman, 2012; Wolf et al., 2015
Emotional processing	Myers et al., 2012; Novakova, Howlett, Baker, & Reuber, 2015; Uliaszek, Prensky, & Baslet, 2012
Coping strategies	Cronje & Pretorius, 2013; Winterdahl et al., 2017
Associated with symptoms – related to seizure, somatic, and psychological symptoms	
Seizure fear/worry	Drane, LaRoche, Ganesh, Teagarden, & Loring, 2016; Myers et al., 2012
Seizure frequency	Robson et al., 2018

Table 2.1 Continued

Seizure freedom	Walther et al., 2019, 2020
Insomnia	Latreille, Baslet, Sarkis, Pavlova, & Dworetzky, 2018; Latreille, Dworetzky, Baslet, & Pavlova, 2019
Fatigue/energy	Myers et al., 2012; Wolf et al., 2015
Pain	Myers et al., 2012
Depression	Gagny et al., 2021; Karakis et al., 2014; LaFrance et al., 2011; Mitchell, Ali, & Cavanna, 2012; Myers et al., 2012; Rawlings et al., 2017b, 2018b; Salinsky et al., 2019
Anxiety	Gagny et al., 2021, Karakis et al., 2014; Rawlings et al., 2017b
Alexithymia	Gagny et al., 2021; Wolf et al., 2015
Dissociation	Gagny et al., 2021; Mitchell et al., 2012
Anger	Myers et al., 2012
Distress	Rawlings et al., 2017b
Dynamic – related to seeking and adhering to treatment	
Psychological treatment	Baslet, Ehlert, Oser, & Dworetzky, 2020; Conwill, Oakley, Evans, & Cavanna, 2014; De Barros, Romano Furlan, Neves Marques, & De Araújo Filho, 2018; Goldstein et al., 2020; LaFrance et al., 2014, 2020; Tolchin et al, 2019a, 2019b
Adherence to treatment	Tolchin et al., 2019a, 2019b

Table 2.2: Antecedents

Antecedent	References
Ability to assess QOL	
QOL measurement tools	Pick et al., 2020
Sociodemographic factors	
Gender	Myers, Trobliger, Bortnik, & Lancman, 2018; Rawlings et al., 2017a, 2017b;
Age	Boesten, Myers, & Wijnen, 2019; Gagny et al., 2021; Myers et al., 2012; Strutt et al., 2011
Education level	Boesten et al., 2019; Robson et al., 2018;
Social support network	Karakis et al., 2014; LaFrance et al., 2011; Ospina et al., 2019
Personal history	
Trauma/abuse	Boesten et al., 2019; Gagny et al., 2021; Johnstone et al., 2016; Myers et al., 2018; Winterdahl et al., 2017; Wolf et al., 2015
PTSD	Gagny et al., 2021; Salinsky et al., 2019
Comorbid psychiatric disorder or epilepsy	Whitehead et al., 2013; Winterdahl et al., 2017
Pathophysiological abnormality	Asadi-Pooya & Homayoun, 2020; Garcia et al., 2018; Johnstone et al., 2016; Winterdahl et al., 2017

Table 2.3: Consequences

Consequence	References
Therapeutic goals and outcomes	
QOL as an outcome measure	Baslet et al., 2020; Conwill et al., 2014; De Barros et al., 2018; Goldstein et al., 2020; LaFrance et al., 2014, 2020; Tolchin et al., 2019a, 2019b
Health and wellness	
Disease impact	Fairclough, Fox, Mercer, Reuber, & Brown, 2014; Pretorius & Sparrow, 2015; Strutt et al., 2011
Normal life	Fairclough et al., 2014; Pretorius & Sparrow, 2015; Rawlings et al., 2018

Chapter III: Part I: Nonpharmacologic Interventions and Seizure Frequency in Patients with Psychogenic Nonepileptic Seizures: An Integrative Review

This manuscript (Scholarly Paper #2) was published in the *Journal of the American Psychiatric Nurses Association*. The manuscript in this dissertation is unchanged from the published version, except for the renumbering of tables to fit the required dissertation format. Sandra Cobb performed the literature review, created the study matrix, analyzed the findings, and wrote the manuscript. Dr. Bradley Vaughn provided feedback on the analysis and content of the manuscript and suggested editorial changes. Dr. Knar Sagherian provided guidance in the integrative review process, provided feedback on the analysis, and suggested editorial changes.

Cobb, S. J., Vaughn, B. V., & Sagherian, K. (2022). Nonpharmacologic interventions and seizure frequency in patients with psychogenic nonepileptic seizures: An integrative review. *Journal of the American Psychiatric Nurses Association*. Advance online publication. https://doi.org/10.1177/10783903221107637

Abstract

Background: Psychogenic nonepileptic seizures (PNES) pose a heavy burden on patients' lives and the healthcare system. The symptoms of PNES are often debilitating and cause high rates of disability and poor quality of life. Many treatment options are available, but there is no clear consensus on best practices.

Aim: To critique and synthesize the current literature on nonpharmacologic interventions and effects on seizure frequency in patients with PNES.

Methods: An integrative review guided by the Whittemore and Knafl approach.

Results: The review included 24 studies published from 2010 to 2020. Interventions for PNES included individualized psychotherapies, group therapies, multimodal psychotherapies, self-help therapies, and complementary and alternative medicine therapies. Individual psychotherapies such as cognitive behavioral therapy and psychoeducation were the most used treatment modalities. The most effective treatments for seizure frequency reduction were those that included multiple psychotherapy sessions with a healthcare provider and covered multiple domains (e.g., understanding of diagnosis, identifying triggers, and developing effective coping strategies).

Conclusions: Seizure frequency can be reduced in patients with PNES with multiple nonpharmacologic interventions. However, seizure frequency is not considered a comprehensive outcome measure and provides little insight into other important life domains. Further research is needed on nonpharmacologic interventions for PNES and effects on other areas of life such as sleep, employment status, global functioning, and self-efficacy.

Key words: Cognitive behavior therapy, outcome studies, psychoeducation, psychotherapy-adult

Background

Psychogenic nonepileptic seizures (PNES) are predominantly considered a somatoform disorder with clinical manifestations similar to epileptic seizures, yet without the electroencephalographic (EEG) changes to correspond with the symptoms (LaFrance et al., 2013). These events include convulsive-like motor activity, atonia, changes in level of consciousness and cognition, and vocalizations. PNES is classified as a functional neurological and conversion disorder because the symptoms are not due to structural disease (Stone, 2009). The etiology of PNES was long misunderstood, with symptoms being attributed to hysteria well into the 20th century (LaFrance & Schachter, 2018). Recent models of PNES mechanisms have interpreted PNES as the activation of dissociated material, hard-wired responses, physical manifestations of emotional distress, or learned behaviors (Reuber & Brown, 2017). However, these models provide an incomplete explanation of the semiology and phenomenology of PNES, or the heterogeneity of the affected population. Reuber and Brown (2017) blended the previous models to create the Integrative Cognitive Model of PNES which interprets PNES as the automatic execution of a learned idea of seizures in response to internal or external stimuli, usually in the context of inhibitory processing dysfunction, typically resulting in the disrupted awareness of the stressor.

PNES are the most common functional neurological disorder seen in neurology clinics (Stone et al., 2010), and are as common as multiple sclerosis and Parkinson's disease (Perez & LaFrance, 2016). Up to 30% of people admitted to epilepsy monitoring units receive a diagnosis of PNES (Baslet et al., 2016). The prevalence of PNES in the general population is estimated to be 2 to 33 per 100,000 (Benbadis & Allen Hauser, 2000). Misdiagnoses and limited access to healthcare coupled with high healthcare costs have led to diagnostic delays of up to seven years for some patients (Baslet et al., 2016).

People with PNES also suffer from poor physical and psychological health. Jennum et al. (2019) found that, when compared to controls, Danish citizens with PNES had significantly increased comorbidities in nearly all *International Classification of Diseases, Tenth Revision* disease categories three years before and after diagnosis. Nightscales et al.'s (2020) study from Australia found that people with PNES had a mortality rate comparable to those with drug-resistant epilepsy, a mortality ratio 2.5 times above the general population. Causes attributed to the higher death rate include "epileptic causes," and external causes such as suicide and drug or medication poisoning and sudden cardiac death in the elderly. A systematic review by Jones et al. (2016) found that people with PNES had worse health-related quality of life (QOL) when compared to people with epilepsy.

Currently, there is no "gold standard" treatment for seizure management in PNES. Treatment ideally must begin with clear and thorough communication of the diagnosis, which can have a therapeutic effect in some patients, with up to one-third experiencing immediate seizure remission without further treatment (LaFrance et al., 2013). However, this is not recommended as lone treatment as most patients require more intensive follow-up. A recent international healthcare provider survey for the International League Against Epilepsy from 28 countries identified psychological therapy as the treatment of choice (Hingray et al., 2018). Popular psychological therapies include cognitive behavioral therapy (CBT), acceptance and commitment therapy (ACT), dialectical behavioral therapy (DBT), interpersonal and psychodynamic therapies, and mindfulness-based therapies (MBT), among others.

Objectives

Most nonpharmacologic treatments primarily aim to reduce the frequency of seizures in the PNES population (Baslet et al., 2015). To date, there has been no comprehensive review on nonpharmacologic treatments and seizure frequency in PNES. Thus, the purpose of this integrative review was to critique and synthesize the published literature on nonpharmacologic interventions and effects on seizure frequency in the PNES population.

Methods

An integrative review method was used for this review to summarize the empirical and theoretical literature, including both experimental and non-experimental studies (Oermann & Hays, 2019). Additionally, a five-stage process to enhance rigor as outlined by Whittemore and Knafl (2005) including problem identification, literature search, data evaluation, data analysis, and presentation was followed for this review.

Searches were conducted in PubMed, PsycINFO (Psychology Information), and CINAHL (Cumulative Index to Nursing & Allied Health Literature) databases utilizing the following terms: (psychogenic OR functional OR dissociat*) AND (nonepileptic OR non-epileptic) AND (seizure OR event OR attack) AND (pseudoseizure OR hysteroepilepsy) AND (treat* OR manage* OR care* OR interven*). The search was limited to only include articles published between January 1, 2010 and October 10, 2020.

The studies were selected based on the following criteria: (a) the participants had diagnoses of PNES with or without comorbid epilepsy, (b) a nonpharmacologic therapy was the primary intervention, (c) a post-intervention seizure frequency outcome was reported, (d) an explanation of the intervention's components was provided, and (e) the sample included participants age 18 years or older. Although the authors of the included studies referred to the disorder in varying terms (e.g., dissociative seizures, nonepileptic attacks), the term PNES will be used in this review for consistency. If a pharmacologic intervention was used in the study, it was only included if there was a nonpharmacologic intervention treatment arm. Studies that focused on nonepileptic events or syncope from physiologic causes (e.g., cardiac dysrhythmias, metabolic disturbances, sleep disorders) were excluded. Studies describing communication of the PNES diagnosis as the primary intervention were excluded. A Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flowchart (Page et al., 2021) provides an overview of the selection process (Figure 3.1). The search yielded a total of 1847 articles: 752 in PubMed, 790 in PsycInfo, and 305 in CINAHL. Duplicates were removed, and the abstracts of

1301 articles were screened for inclusion. Of the screened abstracts, 1232 were excluded according to the inclusion/exclusion criteria. The remaining 69 full-text articles were reviewed, and 45 articles were removed due to the following: no intervention beyond communication of diagnosis, unspecified psychological therapies, pharmacologic-only intervention, no seizure frequency data, and case series or qualitative design. The remaining 24 articles were included in this review.

The 24 articles that met the inclusion criteria were coded using the matrix method to display the characteristics of each study (Oermann & Hays, 2019). Characteristics included: title, authors, year of publication, purpose of study, theoretical and conceptual model, sample characteristics, study design, outcome measures, analysis method, significant results, and limitations.

Results

Study Designs

Table 3.1 presents the study characteristics. Seven (29.17%) of the 24 studies were randomized controlled trials (RCTs), five of which were pilot studies. Fifteen (62.5%) of the studies used quasi-experimental designs, of which four were pilot and two were feasibility studies. The last two (8%) used retrospective observational designs. Double blinding was not used in the RCTs due to the nature of the interventions, which may have led to expectation bias in participants and performance bias in those delivering the interventions. However, blinding was used with statisticians (Goldstein et al., 2020), treatment arm raters (LaFrance et al., 2014), and outcome data collectors (Goldstein et al., 2020; Tolchin, Baslet et al., 2019) in some cases. One quasi-experimental study featured a control group (De Barros et al., 2018), while the remainder contained only a treatment group. The lack of control groups makes it difficult to determine if changes in seizure frequency were due to intervention effects or extraneous variables.

Samples

Of the 24 reviewed studies, 10 limited participants to those with PNES only, and 10 allowed subjects with PNES and comorbid epilepsy to be included. Apart from Ben-Naim et al. (2020) and Conwill et al. (2014), the results of the studies that included participants with epilepsy were presented for the overall sample and not categorized by seizure type. This made it difficult to assess the effectiveness of treatment in the PNES group only. Including participants with PNES and comorbid epilepsy may have caused overestimations in seizure frequency if the participants were unable to differentiate their seizure types. Only three studies addressed this problem by including participants who could distinguish between seizure type (Baslet et al., 2020; Goldstein et al., 2020; Tolchin, Dworetzky, et al., 2019).

Fifteen studies recruited participants whose diagnoses of PNES were confirmed by video EEG. These studies have low misclassification bias and represent the target population of interest because the gold standard in PNES diagnosis was used (LaFrance et al., 2013). However, misdiagnoses or inconclusive results still occur with video EEG. According to Tatum et al. (2020), 20-30% of patients with epilepsy or PNES do not have seizures during video EEG recording, yielding inconclusive results. Misdiagnosis can occur when nontypical events are captured and interpreted as the concerning events, multiple events are not compared for stereotypical behavior, or when scalp electrodes are not adequate to capture the electrical field of the seizure. This is especially relevant when ruling out the differential diagnosis of frontal lobe epilepsy, in which 12-37% of patients do not have epileptiform discharges recorded via scalp electrodes on video EEG (Ramantami et al., 2016). The remaining studies in this review included participants who were diagnosed with PNES by various means including through clinical consensus, ambulatory EEG (without video), or a neurologist based on clinical history when video EEG confirmation was unavailable.

Comorbid psychiatric diagnoses were reported in 16 studies. Posttraumatic stress disorder (PTSD) was the most frequently recorded psychiatric diagnosis. Myers et al. (2017)

required all participants to have comorbid PTSD to be included in the study. Other studies reported PTSD diagnoses in 7-60% of the samples. High rates of depression, mood, anxiety, and personality disorders and history of trauma were reported in many studies, which is consistent with the literature on psychiatric comorbidity in PNES (Baslet et al., 2016).

As expected, the sample size of most studies was small due to the nature of pilot and feasibility studies and was frequently cited as a limitation in these studies. This resulted in a lack of statistical power to detect true effect in some studies. The number of participants in these pilot and feasibility studies ranged from 13 to 71, and 9 to 368 in all other studies. The largest sample size was from a recent study that consisted of 368 participants with PNES (Goldstein et al., 2020).

Demographics

Females accounted for an average of 70.91% of participants in the reviewed studies. This is representative of the PNES population, as the ratio of women to men diagnosed with PNES is 3:1 (Myers et al., 2018). The samples from two studies (Chen et al., 2014; LaFrance et al., 2020) were obtained from U.S. Veterans Affairs Medical Centers with predominantly male patients, resulting in low female participation (25 and 15.63%, respectively). High rates of unemployment were reported in all 17 studies that included economic activity at baseline, with an average of 59.55% unemployed. This rate is significantly higher than national unemployment rates from 2010 to 2020 in all countries included in this review. Global unemployment rates have been below 6% since 2010 (International Labour Office, 2020).

Seizure-Related Outcome Measures

Seizure-related outcomes included seizure frequency and seizure freedom. Seizure diaries were the primary method of seizure frequency data collection in 17 (71%) studies, with the other studies relying on the participant’s recall when seizure diaries were not used. Consistent with the findings of Pick et al. (2020), the operationalization of seizure frequency differed across studies, reflecting daily, weekly, or monthly seizure counts. Although seizure freedom was a commonly reported outcome, the temporal aspect of the concept was inconsistently defined, with required seizure-free time ranging from one to 12 months. None of the studies applied the International League Against Epilepsy's definition of seizure freedom, defined as 12 months of seizure freedom or three times the longest preintervention seizure-free interval (Kwan et al., 2010).

In this review, we focused on seizure frequency as it is the most common self-reported outcome measure in PNES research (Pick et al., 2020). We also operationalized seizure freedom as a seizure frequency of zero. It is important to note that a reduction in seizure frequency was not the primary aim of all the reviewed studies. Other primary aims included improving functioning, stress, emotional symptoms, QOL, healthcare utilization, and adherence to therapy.

Interventions

Five categories of interventions were identified in the literature review: (1) individual psychotherapies, (2) group psychotherapies, (3) multimodal psychotherapies, (4) self-help therapy, and (5) complementary and alternative medicine (CAM) therapy. Each treatment modality and effects on seizure-related outcomes are described here and in Table 3.2.

Individual Psychotherapies

Therapists delivered these treatments during private sessions with individual participants. Individual psychotherapies were used in 13 studies.

Cognitive Behavioral Therapy. CBT focuses on the link between cognition and behaviors, where dysfunctional behaviors are the result of dysfunctional cognitive processes (Delaney & Broach, 2017). The goal of CBT is to help patients change how they think, which may in turn, change behaviors. CBT is the most thoroughly studied treatment for PNES (Baslet et al., 2016), and has been considered a first-line treatment for PNES. Five of the reviewed studies used CBT as the primary intervention. Goldstein et al. (2010) performed a pilot study with CBT interventions focused on helping participants interrupt cognitive and behavioral processes that occur at the beginning of PNES events, and encouraging them to stop activity-avoidance. Goldstein et al. (2020) built upon the pilot study 10 years later with the largest RCT for PNES to date, in which 368 participants were randomized to receive standard medical care or up to 13 CBT sessions specifically designed for PNES plus standard medical care. The content of the CBT sessions was manualized. CBT sessions were augmented with handouts and homework assignments. Berry et al. (2020) retrospectively reviewed the outcomes of CBT in participants with comorbid PNES and epilepsy. Their 12-session treatment protocol was based on the treatment model previously established by Goldstein et al. (2010). LaFrance et al. (2014) also used CBT in their four-arm RCT. Participants were randomized to receive CBT-informed psychotherapy (CBT-ip), flexible-dose sertraline, combined CBT-ip and sertraline, or treatment as usual. The 12-week CBT-ip was developed for patients with PNES. Therapy focused on gaining control of seizures through behavior change and addressed cognitive distortions, somatic misinterpretations, thought processes, and environmental context. The same protocol was used to deliver CBT-ip via clinical video telehealth by LaFrance et al. (2020) in a sample of veterans with PNES. Participants received CBT-ip remotely at their local veteran's hospital or community-based outpatient clinic.

Prolonged Exposure Therapy. Prolonged exposure therapy is a manualized form of CBT that is used to explicitly target the effects of PTSD through the emotional processing of past trauma and repeated exposure to anxiety-evoking situations (Foa et al., 2007). A history of psychological trauma is common in PNES, with rates of PTSD ranging from 9-100% (Fiszman et al., 2004). Myers et al.'s (2017) study focused on prolonged exposure therapy as the primary intervention and offered 12-15 sessions to a sample of 16 participants with dual diagnoses of PNES and PTSD. The first therapy session included psychoeducation on trauma, PTSD, and breathing retraining. Participants were also taught a technique for sensory grounding if a seizure were to occur during a session. For example, at the start of a seizure, the therapist would apply pressure to the forearm or shoulder of the patient while continuing to communicate verbally. The remaining sessions involved imaginal and in vivo exposure therapies and cognitive and emotional processing of therapy session content.

Mindfulness-Based Therapy. Mindfulness refers to the self-regulation of attention focused on experiencing the present moment with an attitude of acceptance and openness (Delaney & Broach, 2017). Mindfulness can be incorporated into other psychotherapies, such as CBT, DBT, and ACT. This type of therapy was used in two studies. Baslet et al. (2020) implemented a 12-session MBT program for participants with PNES. Therapy included goal setting, relaxation techniques, and behavioral regulation. Tolchin, Dworetzky, et al. (2019) used the same MBT protocol in their PNES study.

Motivational Interviewing. Originally developed to treat substance abuse, motivational interviewing is now used to treat other behavioral health problems and other chronic medical conditions in various settings, including PNES (Tolchin et al., 2020). This patient-centered intervention addresses the normal ambivalence people have toward behavioral change and promotes the person’s own role in planning change and remaining compliant with that change (Delaney & Broach, 2017). One study evaluated the effect of motivational interviewing on seizure frequency in participants with PNES. Participants were randomized to receive one session of motivational interviewing plus 12 weeks of MBT or MBT alone. Motivational interviewing sessions were focused on reflective listening and strengthening the participant’s motivation to engage in and adhere to therapy. The MBT sessions followed the same protocol as the previously reviewed MBT studies (Baslet et al., 2020; Tolchin, Dworetzky, et al., 2019).

Psychodynamic Interpersonal Therapy (PIT). Also known as the Conversational Model of Therapy, PIT uses an empathetic approach and specific therapist behaviors to form a collaborative and therapeutic patient-provider relationship (Guthrie & Moorey, 2018). Discursive language is abandoned in favor of feeling language, or the language we use to convey emotion. The therapist then forms understanding hypotheses (used to reflect the client’s feelings), linking hypotheses (used to connect current feelings with other feelings), and explanatory hypotheses (used to explain underlying reasons for current behavior) (Howlett & Reuber, 2009). One study used PIT in a sample of 47 participants with PNES. Mayor et al. (2010) offered up to 19 PIT sessions individualized to meet the participant's needs. The augmented PIT model assumed that the participant's problems arose from disturbances in personal relationships, with dysfunctional interpersonal patterns originating early in life; and that the therapist should use a supportive approach to explore feelings and associated somatic sensations (Howlett et al., 2007).

Psychoeducation. Psychoeducation is provided to patients with a psychiatric diagnosis and is comprised of three core elements: therapeutic interaction, clarification, and enhancing coping competence (Swaminath, 2009). Three of the reviewed studies used psychoeducation as the primary intervention. In a feasibility study, Mayor et al. (2013) studied the effects of four weeks of manualized psychoeducation on seizure frequency in 13 participants with PNES. Psychoeducation was delivered by epilepsy nurses and an assistant psychologist. The conveyed information was intended to change the participant's illness perception and self-management behaviors. Wiseman et al. (2016) used the same manualized psychoeducation protocol in their study in 25 participants with PNES. In this study, psychoeducation was delivered by epilepsy nurses, assistant psychologists, and an occupational therapist. Thompson et al. (2013) randomized 19 participants to receive a one-time PNES psychoeducation session or standard medical care. The sessions were delivered by a board-certified clinical nurse specialist in 40 to 90-minute sessions, depending on the participant's needs. The clinical nurse specialist conveyed a “realistic, but hopeful message” on prognosis and the efficacy of psychological treatment. Reframing was utilized to help participants view negative information in a more positive manner and accept the diagnosis.

Group Therapies

Fehr (2019) stated that group therapy helps people better understand themselves and their relationships with others by acting as a “microcosm of the family, society, and civilization” (p. 35). The corrective environment of group therapy facilitates self-exploration in the context of one’s place in a community. Group therapies utilized the same therapies used in individual therapies, but in a structured, recurring group setting. Group therapies were used is six studies.

Group Psychoeducation. Three studies used group psychoeducation as the primary intervention. Chen et al. (2014) randomized 64 veterans with PNES to receive three 90-minute group psychoeducation sessions or standard medical care in their pilot study. The first session followed a lecture-based format and was dedicated to improving participants’ understanding of PNES. Sessions two and three followed a group discussion format, and focused on underlying emotions that cause physical manifestations and the participants’ active role in recovery. Family members were encouraged to attend. Sarudiansky et al. (2020) offered three group psychoeducation sessions to 12 participants with PNES or PNES with comorbid epilepsy. Session topics included understanding PNES and emotions and living with PNES. Each topic was presented by a group facilitator via PowerPoint, followed by group discussion. Participants were given homework assignments encouraging them to keep a seizure record and record their emotions before seizures. Cope et al.’s (2017) pilot study presented data from 19 participants who attended up to three CBT-based group psychoeducation sessions. Sessions were designed to help participants understand the PNES diagnosis, improve self-management, and meet others with the same diagnosis. Sessions focused on explaining the PNES diagnosis, introducing the CBT model, and managing symptoms Participants were given homework between sessions.

Cognitive Behavioral Therapy-Based Group Therapy. Two studies used CBT-based group therapy as the primary intervention. Conwill et al. (2014) offered four CBT-based group therapy sessions to 10 participants with PNES in a pilot study. Sessions were designed to improve the participants' understanding of PNES and their triggers, reduce negative feelings, and improve self-management. Sessions were facilitated by a liaison nurse and an occupational therapist. De Barros et al. (2018) provided eight weekly CBT-based group therapy sessions to 47 participants with PNES and comorbid temporal lobe epilepsy with mesial temporal sclerosis. Twenty-three eligible patients who could not enroll due to inability to attend the sessions formed a control group. The intervention assumed that trauma results in maladaptive beliefs, cognitive distortions, and somatic symptoms. The group therapy sessions provided education and strategies to identify and cope with these issues.

Dialectical Behavioral Therapy-Based Group Therapy. According to Pederson (2015), DBT was originally developed to treat chronic suicidality and borderline personality disorder when traditional CBT left patients feeling misunderstood and invalidated. DBT is an eclectic mix of behavioral, cognitive-behavioral, acceptance, psychodynamic, and mindfulness therapies. Bullock et al. (2015) used DBT-based group therapy and offered DBT-skills training group sessions to participants with PNES. Sessions were divided into three modules lasting 8-10 weeks each. Sessions were described as psychoeducational in nature. One week of mindfulness training preceded each module.

Multimodal Psychotherapies

In multimodal therapy, the therapist uses a blend of psychotherapeutic approaches based on an assessment of the client's needs. Psychological problems arising from different modalities are addressed using a variety of therapeutic tools. Psychotherapeutic interventions can be chosen based on the client's predominant behaviors or treatment goals. Five of the reviewed studies used multimodal psychotherapies in individual or group formats.

Multimodal Individual Psychotherapy. Multimodal individual psychotherapies were used in two studies. Deleuran et al. (2019) studied long-term outcomes on a group of participants receiving CBT- and/or ACT-based interventions. Psychoeducation was provided during the first session, and the participant was encouraged to identify the psychological problem of focus of the remaining sessions. Therapeutic approaches were adapted moment to moment based on the quality of the factors perpetuating the participant's seizures. When maladaptive behaviors were predominant, CBT-based interventions were used to promote adaptive behaviors. When avoidance of emotions were predominant, ACT-based interventions were used to help the participant form awareness of bodily distress and raise the seizure threshold. Participants received a mean of 12 therapy sessions. Ben-Naim et al. (2020) took medical history, psychological, and social characteristics into account when tailoring treatment for 22 participants in their pilot study. All participants received CBT designed for seizure reduction using the Goldstein et al. (2010) protocol plus at least one additional intervention. Prolonged exposure therapy, based on the same protocol used in the Myers et al. (2017) study, was offered to those with PTSD symptoms. Other interventions included anger management, behavioral activation, emotional processing for early trauma, family interventions, mindfulness, motivational interviewing, problem-solving training, suicide prevention, and social skills training (Ben-Naim et al., 2020).

Multimodal Group Psychotherapy. Metin et al.'s (2013) study used multimodal group psychotherapy and incorporated psychoeducation, behavioral, and psychoanalytic techniques into 12 weekly sessions of group psychotherapy for participants with PNES. Early sessions included psychoeducation on PNES mechanisms and triggers. Later sessions addressed psychodynamic conflict, the meaning of symptoms, and traumatic experiences. The group atmosphere facilitated the participants' connection of seizures with their personal history.

Self-Help Therapy

Self-help refers to using one's own resources to achieve self-improvement. In the context of mental health disorders, self-help is a standardized psychological treatment that patients can work through alone (pure self-help format) or with the guidance and feedback of a healthcare provider (guided self-help, Seekles et al., 2011). One reviewed study used a pure self-help therapy.

Self-Help Stress Management. One reviewed study used self-help stress management as the primary intervention. Novakova et al.'s (2019) pilot RCT used self-help stress management in a sample of 71 participants with PNES, epilepsy, or comorbid PNES and epilepsy, where they were given a six-section self-help stress management booklet to be completed over one week. Participants were randomized to receive the booklet immediately, or delayed by one month (to serve as a control group during the delay period). The intervention included psychoeducation, CBT, and self-affirmation techniques to help participants cope with stress. Participants also received a compact disc on guided muscle relaxation.

Complementary and Alternative Medicine (CAM) Therapy

CAM encompasses any medical practice outside Western standard medical care. CAM use is common in persons with epilepsy and PNES (McConnell et al., 2014). The only CAM therapy included in this review was auricular acupuncture.

Auricular Acupuncture. Acupuncture is a form of Traditional Chinese Medicine most commonly used for pain relief, with stimulation of endogenous endorphin release as the proposed mechanism of action (Kawakita & Okada, 2014). It has shown promise as a treatment for anxiety, depression, and PTSD in a small number of studies. Maa et al. (2020) offered up to 16 twice-weekly auricular acupuncture treatments to participants with PNES. Auricular acupuncture was chosen because of its documented use in PTSD treatment. Participants received acupuncture on five auricular points for 40 minutes per session, as specified by the National Acupuncture Detoxification Association protocol.

Therapeutic Effects on Seizure-Related Outcomes

Seizure reduction is a key outcome of therapy addressing paroxysmal events. Classically, a 50% reduction is considered a standard outcome for many epilepsy trials (Ben-Menachem et al., 2010). Table 3.2 presents the effects of each treatment modality on seizure-related outcomes. Four studies showed statistically significant reductions in seizure frequency when implementing individual or group CBT-based therapies (De Barros et al., 2018; Goldstein et al., 2010; LaFrance et al., 2014, 2020). Interestingly, Goldstein et al. (2020) found no significant decrease in seizure frequency in participants receiving CBT. This is of note, as this was the first adequately powered RCT to assess a psychological therapy for PNES. Even when CBT-based studies showed no statistically significant changes in seizure frequency, it was likely that participants experienced clinically significant improvements when the frequency of reported seizures was reduced. Of note, when LaFrance et al. (2014) combined CBT-ip with sertraline, participants reported greater monthly seizure reduction (59.3%) than those in the CBT-ip-only group (51.4%). However, the study was not powered to detect differences between groups. Seizure frequency also improved significantly with MBT, motivational interviewing, PIT, prolonged exposure therapy, DBT-based group therapy, and multimodal individual and group therapies. Some participant characteristics affected seizure frequency outcomes. For example, participants who were adherent to MBT therapy (defined as attending at least eight sessions in 16 weeks) had significant ≥ 50% reductions in weekly seizure frequency at 12-24-month follow-up compared to nonadherent participants (Tolchin, Dworetzky, et al., 2019), and those who were economically active at baseline were five times more likely to become seizure free after PIT (Mayor et al., 2010). There were no statistically significant improvements in seizure frequency reported in self-help stress management, individual, or group psychoeducation studies. However, many participants likely experienced clinically significant reductions in the frequency of seizures, and seizure freedom improved significantly in one group psychoeducation study (Cope et al., 2017).

Table 3.3 presents the covered topics of each treatment modality. There are some commonalities in the therapies that were most effective in reducing seizure frequency. Most of these therapies included PNES education; identifying triggers and predisposing and perpetuating factors; strategies for reworking cognitions, stress management, and emotion processing; and behavioral techniques to avert seizures.

Discussion

In this review, we described multiple types of available nonpharmacologic treatments used to treat PNES and reduce seizure frequency. These treatments are often based on etiological models, cover multiple treatment topics, and blend treatment modalities to address the complexity of PNES and underlying psychological conditions.

Treatments for PNES have evolved over the centuries from fervent prayer, exorcism of demons, ovarian compression belts to suppress the reproductive organ's influence on the neurological system, and dream interpretation to reveal unconscious desires (LaFrance & Schachter, 2018). Most of these therapies are directed toward etiological models, some of which continue today. According to LaFrance and Bjønæs (2018), PNES are a symptom of an underlying disorder, and understanding the etiology of PNES can help the clinician choose the appropriate treatment option. Goldstein et al. (2020) based their CBT protocol on the fear escape-avoidance model, which conceptualizes PNES as a learned maladaptive behavior in response to cues that may be associated with distressing past experiences. In this model, a person's fears develop through an automatic response to specific stimuli (classical conditioning), and the response is reinforced through the consequences of the behavior (operant conditioning; Goldstein et al., 2018). The person begins to seek safety through avoidance of triggers, and the success in reducing or preventing PNES reinforces the behavior. This is maladaptive since it maintains the link between PNES and seizure cues. Metin et al. (2013) also used operant conditioning techniques in a group setting to reduce PNES episodes by instructing the group to ignore seizures others in the group had during psychotherapy sessions, thus altering the consequences of the behavior. Novakova et al. (2019) structured their self-help stress management intervention based on Cohen's integrative model of stress. Cohen et al. (1995) combined environmental, psychological, and biological traditions of studying stress to illustrate the stress response. In this model, the person evaluates the potential threat of environmental stressors and the capacity to cope. Stress occurs when the environmental stressor is deemed to be a threat and there is a lack of coping capacity. This can trigger maladaptive behavioral and physiological responses, such as PNES. Another popular model in PNES research is the biopsychosocial model. Engel's biopsychosocial model moved medical thinking away from the mind-body dualism of the biomedical model and toward a holistic approach that included multiple dimensions of illness (Borrell-Carrió et al., 2004). Ben-Naim et al. (2020) used this model to tailor each participant's interventions to meet individual therapeutic needs based on biological, psychological, and social characteristics. Given the heterogeneity of the PNES population, it is encouraging to see several etiological-based therapies in use.

Many therapies in this review improved the frequency of seizures, yet it is difficult to identify the most effective treatment modality since the studies are so few, and many of the more effective therapies utilized mixed interventions and amalgamations of multiple psychological therapies. For example, the CBT-ip intervention in the LaFrance et al. (2014, 2020) studies included elements of CBT, motivational interviewing, psychoeducation, interpersonal therapy, CBT schema therapy, DBT, ACT, mindfulness, psychodynamic therapy, and self-efficacy modalities. Mindfulness is a component of many psychological therapies like ACT and DBT (Baslet et al., 2015). All treatments in this review included a psychoeducational component. Psychoeducation alone, either in individual or group therapy format, does not significantly improve seizure frequency. However, it does consistently improve illness perceptions. The most effective treatments in seizure frequency reduction were those that included multiple psychotherapy sessions with a healthcare provider and covered multiple dimensions (understanding of the diagnosis, illness perceptions, identifying triggers, coping strategies and relaxation techniques, emotion regulation, etc.). Even when seizure frequency did not improve with these nonpharmacologic therapies, health and work-related outcomes such as stress, psychological distress, somatic symptoms, illness perceptions, work and social functioning, and QOL have shown improvements. These results must be interpreted with caution due to the heterogeneity of therapies and the limited number of studies for each treatment modality.

Although the studies in this review also reported other outcomes like QOL or depressive symptoms, seizure frequency was the primary outcome in most of the studies. Seizure frequency is the most recorded outcome measure and can be easily compared before and after treatment to show changes in the most prominent clinical manifestations of PNES. However, its usefulness as a clinical indicator has been questioned by some researchers (Durrant et al., 2011; Reuber et al., 2005) and may not even reflect patients' needs and perceptions of desired outcomes. For example, a feeling of loss of control over one's life and the desire to return to a normal life are common themes expressed by the PNES population, as well as a propensity to describe PNES in a "chaos narrative" in which they catastrophize their condition and feel powerless or lack the self-efficacy to change its course (Rawlings et al., 2018). This is consistent with the findings of several studies showing that people with PNES perceive a greater external locus of control over life events and outcomes (Wolf et al., 2020). Although most nonpharmacologic therapies address these issues, measuring seizure frequency does not give insight into changes in these domains. Prognosis is also measured in terms of seizure frequency or remission (Durrant et al., 2011), but it is not a comprehensive measure and gives no indication of the person's status beyond the occurrence of paroxysmal events. Other outcomes such as QOL (Reuber et al., 2005), sleep quality (Latreille et al., 2018), self-efficacy (Rawlings et al., 2018), functional status (Goldstein et al., 2020), and economic activity level (Reuber et al., 2005) may be more comprehensive measures that better reflect patients' needs.

There were several limitations in the studies. For example, the small sample size in many of the studies limits the generalizability of the results. The samples may not be representative of the general PNES population since only people who had the will and means to seek treatment were included. Rejections of the PNES diagnosis and treatment are common (Rawlings & Reuber, 2016), and treatment is further hampered by economic barriers (Hingray et al., 2017). Another limitation was the inclusion of people with both PNES and epilepsy in nearly half of the studies, which made it difficult to assess the effectiveness of the interventions on PNES. Another limitation was the lack of long-term post-intervention outcome data. Many studies only reported data collected at baseline and the end of treatment, and most that reported follow-up data were limited to a post-intervention window of six months or less. Seizures, poor QOL, and impaired psychological functioning persist long-term in up to two-thirds of people with PNES despite psychological treatment (Walther et al., 2019). More research is needed on the long-term effects of nonpharmacologic treatment on seizure frequency and other outcome measures.

Inconsistent terminology used to describe nonepileptic seizures of psychological origin may have caused limitations in this integrative review. While the authors tried to include all variations in terminology in the search terms, some eligible studies may have been missed during database searches. Another limitation of this review is the inclusion of studies that did not differentiate changes in seizure frequency by seizure type when the sample included participants with PNES and/or epilepsy. There is some evidence that psychological therapies reduce seizure frequency in epilepsy (Michaelis et al., 2018). Therefore, effects on seizure frequency in PNES may have been overestimated in this review.

Conclusions

This review identified multiple nonpharmacologic treatments that help reduce seizure frequency in PNES. CBT-based therapies are the most rigorously studied treatments, but other nonpharmacologic therapies (e.g., DBT; MBT; PIT; and prolonged exposure, group, and multimodal therapies) show promise in decreasing seizure frequency in this patient population. More RCTs with larger and more diverse samples are needed to strengthen the body of evidence on the effects of each treatment modality. Possible areas for future research are the long-term effects of seizure frequency reduction through nonpharmacologic interventions on important areas in people’s lives such as sleep, employment status, global functioning, and self-efficacy.

Implications for Practice

People with PNES frequently suffer through years of misdiagnosis before obtaining the proper diagnosis, leading to worse long-term outcomes despite finally receiving appropriate treatment (Walther et al., 2019). Because this has historically been a diagnosis of exclusion, healthcare providers exhibit uncertainty in the diagnosis, treatment, and prognosis of PNES (Rawlings & Reuber, 2018). Given the prevalence of the disorder, comprehensive educational training that focuses on the etiology, clinical features, diagnosis, treatment, and prognosis of PNES is recommended. Although patients with PNES first present to emergency rooms or neurology clinics, psychiatric nurses encounter these patients in clinics once the PNES diagnosis is confirmed and psychological therapy is needed, or in inpatient psychiatric facilities when the patients are hospitalized for either PNES or comorbid psychiatric conditions. Special attention should be given to building a respectful provider-patient relationship, as patients cite this as an important factor in facilitating effective coping and resilience (Rawlings & Reuber, 2016). Based on the results of this review, people with PNES need ongoing, goal-oriented, and comprehensive therapies focused on perception and behavior changes in the context of PNES. Brief educational sessions on PNES do not result in changes in seizure frequency and are not recommended as lone treatment. The heterogeneity of the PNES population requires a flexible treatment plan that incorporates the patient’s perspective and aims to improve life beyond seizure frequency reduction, and may require blended treatment modalities to address the multidimensional nature of PNES. This may be best achieved through a multidisciplinary team approach in which patient responsibilities are distributed among different healthcare providers suited to meet specific therapeutic needs.

References

Baslet, G., Dworetzky, B., Perez, D. L., & Oser, M. (2015). Treatment of psychogenic nonepileptic seizures: Updated review and findings from a mindfulness-based intervention care series. *Clinical EEG & Neuroscience, 46*(1), 54-64. https://doi.org/10.1177/1550059414557025

Baslet, G., Ehlert, A., Oser, M., & Dworetsky, B. A. (2020). Mindfulness-based therapy for psychogenic nonepileptic seizures. *Epilepsy & Behavior, 103*, 106534. https://doi.org/10.1016/j.yebeh.2019.106534

Baslet, G., Seshadri, A., Bermeo-Ovalle, A., Willment, K., & Myers, L. (2016). Psychogenic non-epileptic seizures: An updated primer. *Psychosomatics, 57*(1), 1-17. https://doi.org/10.1016/j.psym.2015.10.004

Benbadis, S. & Allen Hauser, W. (2000). An estimate of the prevalence of psychogenic non-epileptic seizures. *Seizure, 9*(4), 280-281. https://doi.org/10.1053/seiz.2000.0409

Ben-Menachem, E., Sander, J. W., Privitera, M., & Gilliam, F. (2010). Measuring outcomes of treatment with antiepileptic drugs in clinical trials. *Epilepsy & Behavior, 18*(1-2), 24-30. https://doi.org/10.1016/j.yebeh.2010.04.001

Ben-Naim, S., Dienstag, A., Freedman, S. A., Edstein, D., Abo Foul, Y., Gilad, M., Peled, O., Waldman, A., Oster, S., Azoulay, M., Blondheim, S., Arzy, S., & Eitan, R. (2020). A novel integrative psychotherapy for psychogenic nonepileptic seizures based on the biopsychosocial model: A retrospective pilot outcome study. *Psychosomatics, 61*(4), 353-362. https://doi.org/10.1016/j.psym.2020.02.006

Berry, A. J., Yuksel, M., Proctor, B. J., & Foong, J. (2020). Cognitive behavior therapy for comorbid dissociative seizures in patients with epilepsy. *Epilepsy & Behavior, 106*, 106993. https://doi.org/10.1016/j.yebeh.2020.106993

Borrell-Carrió, F., Suchman, A. L., & Epstein, R. M. (2004). The biopsychosocial model 25 years later: Principles, practice, and scientific inquiry. *Annals of Family Medicine, 2*(6), 576-582. https://dx.doi.org/10.1370%2Fafm.245

Bullock, K. D., Mirza, N., Forte, C., & Trockel, M. (2015). Group dialectical-behavior therapy skills training for conversion disorder with seizures. *The Journal of Neuropsychiatry and Clinical Neurosciences, 27*(3), 240-243. https://doi.org/10.1176/appi.neuropsych.13120359

Butler, A. C., Chapman, J. E., Forman, E. M., & Beck, A. T. (2006). The empirical status of cognitive-behavioral therapy: A review of meta-analyses. *Clinical Psychology Review, 26*(1), 17-31. https://doi.org/10.1016/j.cpr.2005.07.003

Chen, D. K., Maheshwari, A., Franks, R., Trolley, G. C., Robinson, J. S., & Hrachovy, R. A. (2014). Brief group psychoeducation for psychogenic nonepileptic seizures: A neurologist-initiated program in an epilepsy center. *Epilepsia, 55*(1), 156-166. https://doi.org/10.1111/epi.12481

Cohen, S., Kessler, R. C., Underwood Gordon, L. (1995). Strategies for measuring stress in studies of psychiatric and physical disorders. In S. Cohen, R. C. Kessler, & L. Underwood Gordon (Eds.), *Measuring stress: A guide for health and social scientists* (pp. 3-28). Oxford University Press.

Conwill, M., Oakley, L., Evans, K., & Cavanna, A. E. (2014). CBT-based group therapy intervention for nonepileptic attacks and other functional neurological symptoms: A pilot study. *Epilepsy & Behavior, 34*, 68-72. https://doi.org/10.1016/j.yebeh.2014.03.012

Cope, S. R., Smith, J. G., King, T., & Agrawal, N. (2017). Evaluation of a pilot innovative cognitive-behavioral therapy-based psychoeducation group treatment for functional non-epileptic attacks. *Epilepsy & Behavior, 70*, 238-244. https://doi.org/10.1016/j.yebeh.2017.02.014

De Barros, A. C. S., Romano Furlan, A. E., Neves Marques, L. H., & De Araújo Filho, G. M. (2018). Effects of a psychotherapeutic group intervention in patients with refractory mesial temporal lobe epilepsy and comorbid psychogenic nonepileptic seizures: A nonrandomized controlled study. *Seizure, 58*, 22-28. https://doi.org/10.1016/j.seizure.2018.03.023

Delaney, K. R., & Broach, R. (2017). Overview of psychotherapy. In K. R. Tusaie, & J. J. Fitzpatrick (Eds.), *Advanced practice psychiatric nursing: Integrating psychotherapy, psychopharmacology, and complementary and alternative approaches across the lifespan* (2nd ed., pp. 39-61). Springer Publishing.

Deleuran, M., Nørgaard, K., Anderson, N. B., & Sabers, A. (2019). Psychogenic nonepileptic seizures treated with psychotherapy: Long-term outcome on seizures and healthcare utilization. *Epilepsy & Behavior, 98*, 195-200. https://doi.org/10.1016/j.yebeh.2019.05.007

Durrant, J., Rickards, H., & Cavanna, A. E. (2011). Prognosis and outcome predictors in psychogenic nonepileptic seizures. *Epilepsy Research and Treatment, 2011*, 274736. https://doi.org/10.1155/2011/274736

Fehr, S. S. (2019). *Introduction to group therapy: A practical guide* (3rd ed.). Routledge.

Fiszman, A., Alves-Leon, S. V., Gomes Nunes, R., D'Andrea, I., & Figueira, I. (2004). Traumatic events and posttraumatic stress disorder in patients with psychogenic nonepileptic seizures: A critical review. *Epilepsy & Behavior, 5*(6), 818–825. https://doi.org/10.1016/j.yebeh.2004.09.002

Foa, E. B., Hembree, E. A., & Rothbaum, B. O. (2007). *Prolonged exposure therapy for PTSD: Emotional processing of traumatic experiences: Therapist guide*. Oxford University Press.

Goldstein, L. H., Chalder, T., Chigwedere, C., Khondoker, M. R., Moriarty, J., Toone, B. K., & Mellers, J. D. C. (2010). Cognitive-behavioral therapy for psychogenic nonepileptic seizures: A pilot RCT. *Neurology, 74*(24), 1986-1994. https://doi.org/10.1212/wnl.0b013e3181e39658

Goldstein, L. H., LaFrance, W. C., Jr., Mellers, J. D. C., & Chalder, T. (2018). Cognitive behavioral based treatments for psychogenic nonepileptic seizures. In W. C. Lafrance, Jr., & S. C. Schachter (Eds.), *Gates and Rowan's nonepileptic seizures* (4th ed., pp. 300-309). Cambridge University Press. https://doi.org/10.1017/9781316275450

Goldstein, L. H., Robinson, E. J., Mellers, J. D. C., Stone, J., Carson, A., Reuber, M., Meford, N., McCrone, P., Murray, J., Richardson, M. P., Pilecka, I., Eastwood, C., Moore, M., Mosweu, I., Perdue, I., Landau, S., & Chalder, T. (2020). Cognitive behavioural therapy for adults with dissociative seizures (CODES): A pragmatic, multicentre, randomized controlled trial. *The Lancet Psychiatry, 7*(6), 491-505. https://doi.org/10.1016/s2215-0366(20)30128-0

Guthrie, E., & Moorey, J. (2018). The theoretical basis of the Conversational Model of Therapy. *Psychoanalytic Psychotherapy, 32*(3), 282-300. https://doi.org/10.1080/02668734.2018.1480055

Hingray, C., El-Hage, W., Duncan, R., Gigineishvili, D., Kanemoto, K., LaFrance, W. C., Jr., de Marinis, A., Paul, R., Pretorius, C., Téllez-Zenteno, J. F., Wiseman, H., & Reuber, M. (2018). Access to diagnostic and therapeutic facilities for psychogenic nonepileptic seizures: An international survey by the ILAE PNES Task Force. *Epilepsia, 59*(1), 203-214. https://doi.org/10.1111/epi.13952

Howlett, S., Grünewald, R. A., Khan, A., & Reuber, M. (2007). Engagement in psychological treatment for functional neurological symptoms – Barriers and solutions. *Psychotherapy Theory, Research, Practice, Training, 44*(3), 354-360. https://doi.org/10.1037/0033-3204.44.3.354

Howlett, S., & Reuber, M. (2009). An augmented model of brief psychodynamic interpersonal therapy for patients with nonepileptic seizures. *Psychotherapy Theory, Research, Practice, Training, 46*(1), 125-138. https://doi.org/10.1037/a0015138

International Labour Office. (2020). *World employment and social outlook: Trends 2020.*

International Labour Organization. https://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/---publ/documents/publication/wcms_734455.pdf

Jennum, P., Ibsen, R., & Kjellberg, J. (2019). Morbidity and mortality of nonepileptic seizures (NES): A controlled national study. *Epilepsy & Behavior, 96*, 229-233. https://doi.org/10.1016/j.yebeh.2019.03.016

Jones, B., Reuber, M., & Norman, P. (2016). Correlates of health-related quality of life in adults with psychogenic nonepileptic seizures: A systematic review. *Epilepsia, 57*(2), 171-181. https://doi.org/10.1111/epi.13268

Kawakita, K., & Okada, K. (2014). Acupuncture therapy: Mechanism of action, efficacy, and safety: A potential intervention for psychogenic disorders? *Biopsychosocial Medicine, 8*, 4. https://dx.doi.org/10.1186%2F1751-0759-8-4

Kwan, P., Arzimanoglou, A., Berg, A. T., Brodie, M. J., Allen Hauser, W., Mathern, G., Moshé, S. L., Perucca, E., Wiebe, S., French, J. (2010). Definition of drug resistant epilepsy: Consensus proposal by the ad hoc Task Force of the ILAE Commission on Therapeutic Strategies. *Epilepsia, 51*(6), 1069-1077. https://doi.org/10.1111/j.1528-1167.2009.02397.x

LaFrance, W. C., Jr., Baird, G. L., Barry, J. J., Blum, A. S., Webb, A. F., Keitner, G. I., Machan, J. T., Miller, I., Szaflarski, J. P., & NES Treatment Trial (NEST-T) Consortium. (2014). Multicenter pilot treatment trial for psychogenic nonepileptic seizures: a randomized clinical trial. *JAMA Psychiatry, 71*(9), 997-1005. https://doi.org/10.1001/jamapsychiatry.2014.817

LaFrance, W. C., Jr., Baker, G. A., Duncan, R., Goldstein, L. H., & Reuber, M. (2013). Minimum requirements for the diagnosis of psychogenic nonepileptic seizures: A staged approach – A report from the International League Against Epilepsy Nonepileptic Seizure Task Force. *Epilepsia, 54*(11), 2005-2018. https://doi.org/10.1111/epi.12356

LaFrance, W. C., Jr., & Bjønæs, H. (2018). Designing treatment plans based on etiology of psychogenic nonepileptic seizures. In W. C. Lafrance, Jr., & S. C. Schachter (Eds.), *Gates and Rowan's nonepileptic seizures* (4th ed., pp. 283-299). Cambridge University Press. https://doi.org/10.1017/9781316275450

LaFrance, W. C., Jr., Ho, W. L. N., Bhatla, A., Baird, G. L., Atalib, H. H., & Godleski, L. (2020). Treatment of psychogenic nonepileptic seizures (PNES) using video telehealth. *Epilepsia. 61*(11), 2572-2582. https://doi.org/10.1111/epi.16689

LaFrance, W. C., Jr., & Schachter, S. C. (2018). Historical approaches to treatments for psychogenic nonepileptic seizures. In W. C. Lafrance, Jr., & S. C. Schachter (Eds.), *Gates and Rowan's nonepileptic seizures* (4th ed., pp. 257-261). Cambridge University Press. https://doi.org/10.1017/9781316275450

Latreille, V., Baslet, G., Sarkis, R., Pavlova, M., & Dworetzky, B. A. (2018). Sleep in psychogenic nonepileptic seizures: Time to raise a red flag. *Epilepsy & Behavior, 86*, 6-8. https://doi.org/10.1016/j.yebeh.2018.07.001

Maa, E., Applegate, M., & Keniston, A. (2020). Auricular acupuncture for the treatment of nonepileptic seizures: A pilot study. *Epilepsy & Behavior, 111*, 107329. https://doi.org/10.1016/j.yebeh.2020.107329

Mayor, R., Brown, R. J., Cock, H., House, A., Howlett, S., Smith, P., & Reuber, M. (2013). A feasibility study of a brief psycho-educational intervention for psychogenic nonepileptic seizures. *Seizure, 22*(9), 760-765. https://doi.org/10.1016/j.seizure.2013.06.008

Mayor, R., Howlett, S., Grünewald, R., & Reuber, M. (2010). Long-term outcome of brief augmented psychodynamic interpersonal therapy for psychogenic nonepileptic seizures: Seizure control and health care utilization. *Epilepsia, 51*(7), 1169-1176. https://doi.org/10.1111/j.1528-1167.2010.02656.x

McConnell, B. V., Applegate, M., Keniston, A., Kluger, B., & Maa, E. H. (2014). Use of complementary and alternative medicine in an urban county hospital epilepsy clinic. *Epilepsy & Behavior, 34*, 73-76. http://dx.doi.org/10.1016/j.yebeh.2014.03.011

Metin, S. Z., Ozmen, M., Metin, B., Talasman, S., Yeni, S. N., & Ozkara, C. (2013). Treatment with group psychotherapy for chronic psychogenic nonepileptic seizures. *Epilepsy & Behavior, 28*(1), 91-94. https://doi.org/10.1016/j.yebeh.2013.03.023

Michaelis, R., Tang, V., Goldstein, L. H., Reuber, M., LaFrance, W. C., Jr., Lundgren, T., Modi, A. C., & Wagner, J. L. (2018). Psychological treatments for adults and children with epilepsy: Evidence-based recommendations by the International League Against Epilepsy Psychology Task Force. *Epilepsia, 59*(7), 1282-1302. https://doi.org/10.1111/epi.14444

Myers, L., Trobliger, R., Bortnik, K., & Lancman, M. (2018). Are there gender differences in those diagnosed with psychogenic nonepileptic seizures? *Epilepsy & Behavior, 78*, 161-165. https://doi.org/10.1016/j.yebeh.2017.10.019

Myers, L., Vaidya-Mathur, U., & Lancman, M. (2017). Prolonged exposure therapy for the treatment of patients diagnosed with psychogenic non-epileptic seizures (PNES) and post-traumatic stress disorder (PTSD). *Epilepsy & Behavior, 66*, 86-92. https://doi.org/10.1016/j.yebeh.2016.10.019

Nightscales, R., McCartney, L., Auvrez, C., Tao, G., Barnard, S., Malpas, C. B., Perucca, P., McIntosh, A., Chen, Z., Sivathamboo, S., Ignatiadis, S., Jones, S., Adams, S., Cook, M. J., Kwan, P., Velakoulis, D., D'Souza, W., Berkovic, S. F., & O'Brien, T. J. (2020). Mortality in patients with psychogenic nonepileptic seizures. *Neurology, 95*(6), e643-e652. https://doi.org/10.1212/WNL.0000000000009855

Novakova, B., Harris, P. R., Rawlings, G. H., & Reuber, M. (2019). Coping with stress: A pilot of a self-help study of a self-help stress management intervention for patients with epileptic or psychogenic nonepileptic seizures. *Epilepsy & Behavior, 94*, 169-177. https://doi.org/10.1016/j.yebeh.2019.03.002

Oermann, M. H. & Hays, J. C. (2019). *Writing for publication in nursing* (4th ed.). Springer Publishing Company.

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boultron, I., Hoffmann, T. C., Murlow, C. D., Shamseer, L., Tetzlaff, J. M., Aki, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., . . . Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ, 372*, 71. https://doi.org/10.1136/bmj.n71

Pederson, L. D. (2015). *Dialectical behavior therapy: A contemporary guide for practitioners*. Wiley Blackwell.

Perez, D. L., & LaFrance, W. C., Jr. (2016). Nonepileptic seizures: An updated review. *CNS Spectrums, 21*(3), 239-246. https://dx.doi.org/10.1017%2FS109285291600002X

Pick, S., Anderson, D. G., Asadi-Pooya, A. A., Aybek, S., Baslet, G., Bloem, B. R., Bradley-Westguard, A., Brown, R. J., Carson, A. J., Chalder, T., Damianova, M., David, A. S., Edwards, M. J., Epstein, S. A., Espay, A. J., Garcin, B., Goldstein, L. H., Hallett, M., Jankovic, J., … Nicholson, T. R. (2020). Outcome measurement in functional neurological disorder: A systematic review and recommendations. *Journal of Neurology, Neurosurgery and Psychiatry, 91*(6), 638–649. https://doi.org/10.1136/jnnp-2019-322180

Ramantani, G., Maillard, L., & Koessler, L. (2016). Correlation of invasive EEG and scalp EEG. *Seizure, 41*, 196-200. https://doi.org/10.1016/j.seizure.2016.05.018

Rawlings, G. H., Brown, I., Stone, B., & Reuber, M. (2018). Written accounts of living with epilepsy or psychogenic nonepileptic seizures: A thematic comparison. *Qualitative Health Research, 28*(6), 950-962. https://doi.org/10.1177/1049732317748897

Rawlings, G. H., & Reuber, M. (2016). What patients say about living with psychogenic nonepileptic seizures: A systematic synthesis of qualitative studies. *Seizure, 41*, 100-111. https://doi.org/10.1016/j.seizure.2016.07.014

Rawlings, G. H., & Reuber, M. (2018). Health care practitioners' perceptions of psychogenic nonepileptic seizures: A systematic review of qualitative and quantitative studies. *Epilepsia, 59*(6), 1109-1123. https://doi.org/10.1111/epi.14189

Reuber, M., & Brown, R. J. (2017). Understanding psychogenic nonepileptic seizures – Phenomenology, semiology and the Integrative Cognitive Model. *Seizure, 44*, 199-205. http://dx.doi.org/10.1016/j.seizure.2016.10.029

Reuber, M., Mitchell, A. J., Howlett, S., & Elger, C. E. (2005). Measuring outcome in psychogenic nonepileptic seizures: How relevant is seizure remission? *Epilepsia, 46*(11), 1788-1795. https://doi.org/10.1111/j.1528-1167.2005.00280.x

Sarudiansky, M., Pablo Korman, G., Inés Lanzillotti, A., Areco Pico, M. M., Tenreyro, C., Valdez Paolasini, G., Wolfzun, C., Kochen, S., D'Alessio, L., & Myers, L. (2020). Report on a psychoeducational intervention for psychogenic non-epileptic seizures in Argentina. *Seizure, 80*, 270-277. https://doi.org/10.1016/j.seizure.2020.04.008

Seekles, W., van Straten, A., Beekman, A., van Marwijk, H., & Cuijpers, P. (2011). Effectiveness of guided self-help for depression and anxiety disorders in primary care: A pragmatic randomized controlled trial. *Psychiatry Research, 187*, 113-120. http://dx.doi.org/10.1016/j.psychres.2010.11.015

Stone, J. (2009). Functional symptoms in neurology. *Practical Neurology, 9*(3), 179-189. http://dx.doi.org/10.1136/jnnp.2009.177204

Stone, J., Carson, A., Duncan, R., Roberts, R., Warlow, C., Hibberd, C., Coleman, R., Cull, R., Murray, G., Pelosi, A., Cavanaugh, J., Matthews, K., Goldbeck, R., Smyth, R., Walker, J., & Sharpe, M. (2010). Who is referred to neurology clinics? – The diagnoses made in 3781 new patients. *Clinical Neurology and Neurosurgery, 112*(9), 747-751. https://doi.org/10.1016/j.clineuro.2010.05.011

Swaminath, G. (2009). Psychoeducation. *Indian Journal of Psychiatry, 51*(3), 171-172. https://doi.org/10.4103/0019-5545.55082

Tatum, W. O., Mani, J., Jin, K., Halford, J. J., Gloss, D., Fahoum, F., Maillard, L., Mothersill, I., & Beniczky, S. (2020). *Minimum standards for long-term video-EEG monitoring*

[Guideline]. International League Against Epilepsy. https://www.ilae.org/files/dmfile/Draft-Minimum-Standards-for-LT-Video-EEG-Monitoring.pdf

Thompson, N., Connelly, L., Peltzer, J., Nowack, W. J., Hamera, E., & Hunter, E. E. (2013). Psychogenic nonepileptic seizures: A pilot study of a brief educational intervention. *Perspectives in Psychiatric Care, 49*(2), 78-83. https://doi.org/10.1111/j.1744-6163.2012.00353.x

Tolchin, B., Baslet, G., Martino, S., Suzuki, J., Blumenfeld, H., Hirsch, L. J., Altalib, H., & Dworetzky, B. A. (2020). Motivational interviewing techniques to improve psychotherapy adherence and outcomes for patients with psychogenic nonepileptic seizures. *The Journal of Neuropsychiatry and Clinical Neurosciences, 32*(2), 125-131. https://doi.org/10.1176/appi.neuropsych.19020045

Tolchin, B. Baslet, G., Suzuki, J., Martino, S., Blumenfeld, H., Hirsch, L. J., Altalib, H., & Dworetzky, B. A. (2019). Randomized controlled trial of motivational interviewing for psychogenic nonepileptic seizures. *Epilepsia, 60*(5), 986-995. https://doi.org/10.1111/epi.14728

Tolchin, B., Dworetzky, B. A., Martino, S., Blumenfeld, H., Hirsch, L. J., & Baslet, G. (2019). Adherence with psychotherapy and treatment outcomes for psychogenic nonepileptic seizures. *Neurology, 92*(7), e675-e679. https://doi.org/10.1212/wnl.0000000000006848

Walther, K., Volbers, B., Erdmann, L., Dogan Onugoren, M., Gollwitzer, S., Kasper, B. S., Kurzbuch, K., Lang, J., Schwab, S., Schwarz, M., & Hamer, H. M. (2019). Psychological long-term outcome in patients with psychogenic nonepileptic seizures. *Epilepsia, 60*(4), 669-678. https://doi.org/10.1111/epi.14682

Whittemore, R., & Knafl, K. (2005). The integrative review: Updated methodology. *Journal of Advanced Nursing, 52*(5), 546-553. https://doi.org/10.1111/j.1365-2648.2005.03621.x

Wiseman, H., Mousa, S., Howlett, S., & Reuber, M. (2016). A multicenter evaluation of a brief manualized psychoeducation intervention for psychogenic nonepileptic seizures delivered by health professionals with limited experience in psychological treatment. *Epilepsy & Behavior, 63*, 50-56. https://doi.org/10.1016/j.yebeh.2016.07.033

Wolf, P., Lin, K., Mameniškiené, R., & Walz, R. (2020). Does epilepsy have an impact on locus of control. *Frontiers in Psychology, 11*, 2251. https://dx.doi.org/10.3389%2Ffpsyg.2020.02251

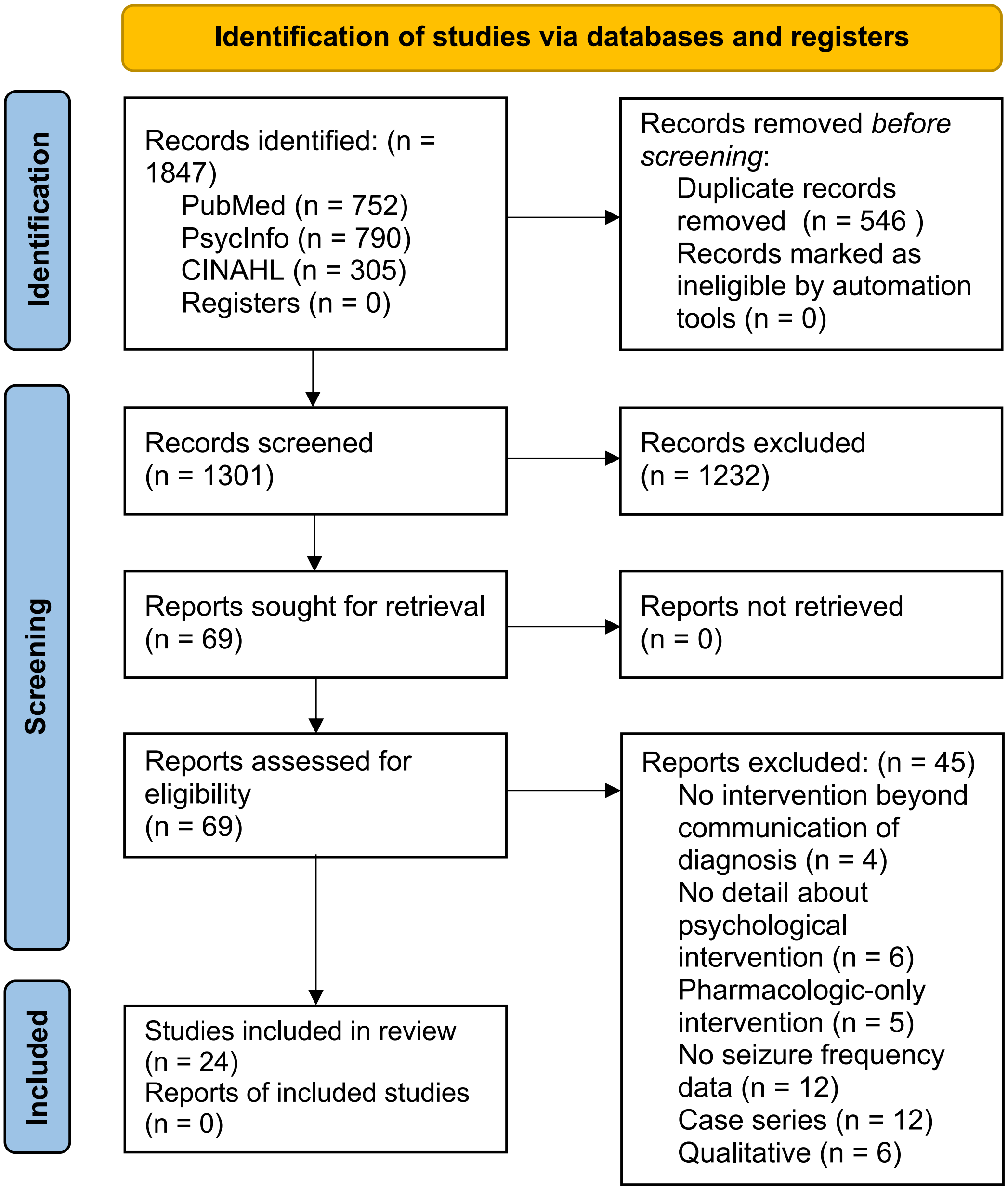

Figure 3.1: PRISMA Flow Diagram (Page et al., 2021)

Table 3.1: Study Characteristics

Author, date	Study type	Country	Diagnosis	Sample included in analysis	% Female	% Unemployed at baseline
Baslet et al. (2020)	Quasi-experimental	U.S.	PNES**	64	85.71	55.1
Ben-Naim et al. (2020)	Quasi-experimental*	Israel	PNES** +/- epilepsy	22	68.18	68.2
Berry et al. (2020)	Retrospective	U.K.	PNES with epilepsy	14	57.1	N/A
Bullock et al. (2015)	Quasi-experimental*	U.S.	PNES** +/- epilepsy	19	94.7	89.47
Chen et al. (2014)	RCT*	U.S.	PNES**	43	25	82.8
Conwill et al. (2014)	Quasi-experimental*	U.K.	PNES** or other FNS	16	75	68.75
Cope et al. (2017)	Quasi-experimental*	U.K.	PNES	19	84	48
De Barros et al. (2018)	Quasi-experimental	Brazil	PNES** + TLE-MTS	70	52.9	N/A
Deleuran et al. (2019)	Retrospective	Denmark	PNES	42	86	54.76
Goldstein et al. (2010)	RCT*	U.K.	PNES	64	76	46.97
Goldstein et al. (2020)	RCT	U.K.	PNES +/- epilepsy	368	72	66.3
LaFrance et al. (2014)	RCT*	U.S.	PNES**	34	91	64.71
LaFrance et al. (2020)	Quasi-experimental	U.S.	PNES** +/- epilepsy	32	15.63	65.63
Maa et al. (2020)	Quasi-experimental*	U.S.	PNES**	21	72	N/A

Table 3.1 Continued

Mayor et al. (2013)	Quasi-experimental*	U.K.	PNES	13	76	62
Mayor et al. (2010)	Quasi-experimental	U.K.	PNES	47	70.2	53.2
Metin et al. (2013)	Quasi-experimental	N/A	PNES**	9	88	N/A
Myers et al. (2017)	Quasi-experimental	U.S.	PNES + PTSD	16	81	N/A
Novakova et al. (2019)	RCT*	U.K.	PNES +/- epilepsy or epilepsy	71	70.4	49.3
Sarudiansky et al. (2020)	Quasi-experimental	Argentina	PNES** +/- epilepsy	12	83.3	33.3
Thompson et al. (2013)	RCT*	U.S.	PNES**	19	60	N/A
Tolchin, Baslet, et al. (2019)	RCT	U.S.	PNES**	55	81.7	N/A
Tolchin, Dworetzky et al. (2019)	Quasi-experimental	U.S.	PNES** +/- epilepsy	93	85	61.9
Wiseman et al. (2016)	Quasi-experimental	U.K.	PNES +/- epilepsy	25	52	42

Note. FNS = functional neurological symptoms; N/A = none available; PTSD = posttraumatic stress disorder; PNES = psychogenic nonepileptic seizures; RCT = randomized controlled trial; TLE-MTS = temporal lobe epilepsy-mesial temporal sclerosis; U.K. = United Kingdom; U.S. = United States.

* Pilot or feasibility study.

** PNES confirmed by video EEG.

Table 3.2: Interventions, Treatment Lengths, and Effects on Seizure Frequency

Intervention, author, date	Treatment length	Effects on Seizure Frequency
Individual CBT		
Berry et al. (2020)	12 weekly/ biweekly sessions	No statistically significant change in seizure frequency. ↓ seizure frequency in 91.67%. Mean weekly seizure frequency decreased from 23.9 pre-intervention to 15.6 post-intervention*.
Goldstein et al. (2010)	12 weekly/ biweekly sessions	↓ seizure frequency at EOT compared to standard medical care group (*p* = .002), with trend toward lower seizure frequency at 6-month FU (*p* = .082).
Goldstein et al. (2020)	12 sessions over 4-5-months	No statistically significant change in monthly seizure frequency between groups at 12-month FU. Periods of seizure freedom in the previous 6 months nearly two-thirds longer in CBT group (*p* = .001).
LaFrance et al. (2014)	12 weekly sessions	↓ monthly seizure frequency by 51.4% in CBT-ip group (*p* = .01) and 59.3% in CBT-ip + sertraline group (*p* = .008) at EOT when compared to baseline. ≥ 50% reduction in monthly seizure frequency at EOT in CBT-ip (55.6%), CBT-ip + sertraline (66.7%), and sertraline (55.6%) groups*. 6.2 times greater odds of achieving seizure freedom when receiving CBT-ip.
LaFrance et al. (2020)	12 sessions via telehealth	↓ monthly seizure frequency by 45.7% per month of treatment (*p* = .0001), approaching 0 seizures by 6 months.
Prolonged exposure therapy		
Myers et al. (2017)	12-15 sessions	↓ seizure frequency at EOT (*p* = .001), maintained at 1-34-month FU (*p* = .028).

Table 3.2 Continued

Mindfulness-based therapy		
Baslet et al. (2020)	12 weekly sessions	↓ median seizure frequency by 0.12 episodes per week with each session (*p* = .002). Seizure freedom at the last session since the previous session in 50%. Sustained seizure cessation during the last 4 weeks of treatment in 23%*. 50% reduction in weekly seizure frequency in 70% at EOT*.
Tolchin, Dworetzky et al. (2019)	12 sessions + 4 neuropsychiatrist visits	≥ 50% reduction in seizure frequency in 84% of participants adherent to therapy and 61% nonadherent at 12-24-month FU (*p* = .021). No statistically significant difference in seizure freedom between adherent (70%) and nonadherent (57%) groups.
Motivational interviewing		
Tolchin, Baslet, et al. (2019)	12 sessions of mindfulness + 1 session of motivational interviewing	↓ seizure frequency by 76.2% in motivational interview group compared to decrease by 34.8% in control group at 16-week FU (*p* = .034). No statistically significant difference in seizure freedom between motivational interview (30.8%) and control (10.7%) groups.
Psychodynamic interpersonal therapy		
Mayor et al. (2010)	Up to 20 weekly/ biweekly sessions	↓ median seizure frequency from 6 to 1 per month (*p* < .007) at FU. Seizure freedom for 6-12 months in 25.5% at FU*. >50% reduction in seizure frequency in 40.4% at FU*.
Individual Psychoeducation		

Table 3.2 Continued

Mayor et al. (2013)	4 weekly sessions	No change in median seizure frequency at 3-month FU*. Seizure freedom in 30.77% at FU*. >50% reduction in seizure frequency in 23.08% at FU*.
Thompson et al. (2013)	One-time session	No statistically significant change in seizure frequency.
Wiseman et al. (2016)	4 weekly sessions	No statistically significant change in seizure frequency. Seizure freedom in 24% and seizure reduction in 24% at EOT*.
Group psychoeducation		
Chen et al. (2014)	3 monthly sessions	No statistically significant change in seizure frequency.
Cope et al. (2017)	3 sessions	↓ seizure frequency in 75% at EOT*. Seizure cessation in 40% at EOT compared to 11% at baseline (*p* = .032).
Sarudiansky et al. (2020)	3 bimonthly sessions	↓ seizure frequency in 41.67% at EOT, ↑ seizure frequency in 41.67%*.
CBT-based group therapy		
Conwill et al. (2014)	4 sessions	↓ mean monthly seizure frequency from 13.8 at baseline to 12.3 at EOT*.
De Barros et al. (2018)	8 weekly sessions	↓ monthly seizure frequency at EOT compared to controls (*p* = .02).
Dialectical behavioral-based group therapy		

Table 3.2 Continued

Bullock et al. (2015)	24-30 weekly sessions divided into 3 modules	↓ weekly seizure frequency from 13.8 at baseline to 4.7 at EOT ($p = .002$). ≥ 50% reduction in weekly seizure frequency in 53% at EOT*. Seizure cessation in 35.29% at EOT, but half occurred after enrollment and before treatment began*.
Multimodal individual psychotherapy		
Ben-Naim et al. (2020)	Weekly sessions for 2-48 months	↓ seizure frequency at EOT ($p < .001$) and 24-month FU ($p = .005$)
Deleuran et al. (2019)	Average of 12 sessions over 15 months	↓ monthly seizure frequency at EOT, 12-, and 24-month FU ($p < .0001$). Seizure freedom for the past 3 months in 45% ($p < .0001$), and >50% reduction in seizure frequency in 36% at EOT ($p < .0001$).
Multimodal group psychotherapy		
Metin et al. (2013)	12 weekly sessions	↓ seizure frequency sustained from baseline to 12-month FU ($p < .0001$). Seizure freedom in 66.67% at FU*. >50% reduction in seizure frequency in 100% at FU*.
Self-help stress management		
Novakova et al. (2019)	6-section workbook	No statistically significant change in seizure frequency at 1-month FU.
Auricular acupuncture		

Table 3.2 Continued

Maa et al. (2020)	Twice weekly sessions for 8 weeks	↓ seizure frequency from baseline at treatment month 1, month 2, and 1-month FU (*p* = .0083). 50% reduction in seizure frequency in 52.3% at EOT, maintained by 38% at 1-month FU*. Seizure freedom in 14% at EOT, maintained at 1-month FU. Seizure frequency rebounded to baseline or worse at 1-month FU in 29%*.

Note. CBT = cognitive behavioral therapy; CBT-ip = CBT-informed psychotherapy; EOT = end of treatment; FU = follow-up.

*Descriptive statistics only

Table 3.3: Treatment Modalities and Topics

Treatment	Treatment Topics
CBT-based interventions (individual and group)	PNES education Evaluating sociodemographic characteristics, anxiety, and depression symptoms Identifying preseizure auras, seizures, predisposing and perpetuating factors, past traumas, triggers, and consequences Reducing negative feelings, thought distortions, thinking errors, fears, and avoidance behavior Medication options Improving interpersonal relationships and finding support Averting, managing, and recovering from seizures and other symptoms Stress management, coping and problem-solving strategies Conflict resolution Enhancing wellness Relaxation and distraction techniques Goal setting and taking control
Prolonged exposure therapy	Revisiting traumatic memories (imaginal exposure) Exposure to avoided situations (in vivo exposure) Education on trauma reactions Breathing retraining
Mindfulness-based therapy	PNES education Stress and emotion management strategies Mindfulness training and reworking cognitions Relapse prevention
Motivational interviewing	Engaging in a patient-centered, empathetic relationship Focusing on helping the patient identify the need for behavior change through treatment Evoking the patient’s reasons for wanting treatment Planning behavioral change and participation in psychotherapy

Table 3.3 Continued

Psychodynamic interpersonal therapy	Identifying predisposing, precipitating, and perpetuating factors Cognitive and behavioral techniques to avert PNES, panic attacks, or flashbacks
Psychoeducation (individual and group)	PNES education Identifying strengths, stressors, perpetuating factors, triggers, unhelpful thoughts, and avoidance behaviors Illness perceptions, stigma, and shame Sharing experiences with PNES Emotional processing and stress management Functional limitations, seizure safety measures, and control techniques Relaxation, behavioral, and distress tolerance techniques Constructing plans to manage seizures and restart avoided activities
Dialectical behavioral therapy	Distress tolerance Emotion regulation Interpersonal effectiveness Mindfulness
Self-help stress management	Understanding and identifying stress Clarifying values and priorities CBT-based coping strategies Finding support resources Goal setting
Multimodal therapies (individual and group)	PNES education for patients and families Identifying triggers, perpetuating factors, and unconscious motivations Negative emotions and emotional processing Sharing experiences with PNES Cognitive restructuring, mindfulness, and exposure Relaxation, distraction, adaptive behavior, and distress tolerance techniques
Auricular acupuncture	None reported

Note. CBT = cognitive behavioral therapy; PNES = psychogenic nonepileptic seizures

Chapter III: Part II: Nonpharmacologic Interventions and Quality of Life in Patients with Psychogenic Nonepileptic Seizures: An Integrative Review

This manuscript is Part II of Scholarly Paper #2 (Chapter III: Part I).

Abstract

Background: Patients with psychogenic nonepileptic seizures (PNES) report poor quality of life (QOL). While many treatments aim to reduce seizure frequency, improving QOL is often an additional primary or secondary goal.

Aim: To critique and synthesize the current literature on nonpharmacologic interventions and effects on QOL in patients with PNES.

Methods: An integrative review guided by the Whittemore and Knafl approach.

Results: The review included 12 studies published from 2010 to 2020. Interventions for PNES included individualized psychotherapies, group therapies, multimodal psychotherapies and self-help therapies. Cognitive behavioral therapy-based interventions were the most used treatment modalities and showed the most evidence for improving QOL in patients with PNES.

Conclusions: Quality of life can be improved in patients with PNES who receive nonpharmacologic therapies, even in the absence of seizure reduction. Further research is needed on the effects of other available treatment modalities on QOL in the PNES population.

Background

Quality of life (QOL) is a broad concept composed of multiple domains important to a person’s overall well-being. The concept of QOL in the context of healthcare began to form in the 1940s when the World Health Organization included the need for multidimensional well-being in their definition of health (Post, 2014). Quality of life gained prominence in American culture in the 1960s when President Lyndon B. Johnson aimed to create the nation’s first Great Society, in which success would be measured by the quality of people’s lives rather than financial assets (Meeberg, 1993). As interest in improving overall well-being grew, QOL gained traction as a therapeutic goal linked to health equity and basic human rights (De Negri Filho, 2008).

People with PNES are known to report considerably worse QOL when compared to those with epilepsy (Jones et al., 2016). Seizure frequency, somatic symptoms, depression, anxiety, dysfunctional social support structures, and maladaptive coping skills are just a few factors that contribute to decreased QOL in patients with PNES. Preexisting psychiatric conditions and past traumas further decrease QOL.

Although seizure frequency is the primary outcome measure in most PNES intervention studies, it has been suggested that QOL may be a more useful and comprehensive outcome measure (Reuber et al., 2005; Wiseman et al., 2018) that can be used to assess subjective experience and the impact of illness and healthcare interventions (Addington-Hall & Kalra, 2001). Researchers have also noted that measuring QOL can provide valuable insight into a person’s physical functional status, which is a QOL domain that is greatly affected by PNES. QOL is sometimes assessed in PNES treatment studies, but usually as a secondary outcome measure.

Objectives

In Part 1 of this chapter, 24 studies on nonpharmacologic interventions for PNES were reviewed for their effects on seizure frequency (Cobb et al., 2022). Part 2 of this chapter aimed to review the effects of these nonpharmacologic interventions on QOL in patients with PNES.

Methods

The 24 studies from Part 1 were reviewed for their inclusion of outcome measures other than seizure frequency. Studies were included in this review if QOL was recorded as a primary or secondary outcome measure. Characteristics of each of the included studies was entered into a matrix and evaluated for intervention effects on QOL.

Results

Quality of Life Instruments

Quality of life was assessed in 12 studies (Baslet et al., 2020; Conwill et al., 2014; De Barros et al., 2018; Goldstein et al., 2020; LaFrance et al., 2014, 2020; Metin et al., 2013; Novakova et al., 2019; Thompson et al., 2013; Tolchin, Baslet, et al., 2019; Tolchin, Dworetzky, et al., 2019; Wiseman et al., 2016) using seven instruments. The Short Form Health Survey-36 (SF-36) was the most frequently used general QOL measure, while the Quality of Life in Newly Diagnosed Epilepsy-6 Dimensions (NEWQOL-6D) and the Quality of Life in Epilepsy-10 or -31 (QOLIE-10/31) were the most frequently used seizure-specific QOL measures. The QOLIE questionnaire was designed for use in patients with epilepsy and has not been validated for use in patients with PNES (Wiseman et al., 2018). However, it is the most used QOL instrument in PNES research (Jones et al., 2016).

Interventions

Quality of life was assessed in studies used the following interventions: individual cognitive behavioral therapy (CBT), mindfulness-based therapy (MBT), motivational interviewing, psychoeducation, CBT-based group therapy, multimodal group therapy, and self-help stress management. For a detailed description of each treatment modality, see Chapter 3: Part 1 (Cobb et al., 2022).

Therapeutic Effects on Quality of Life

Statistically significant improvements in QOL were seen in all CBT (Goldstein et al., 2020; LaFrance et al., 2014, 2020), MBT (Baslet et al., 2020; Tolchin, Dworetzky, et al., 2019), and motivational interviewing (Tolchin et al., 2020) studies in which QOL was assessed. Results were mixed in individual psychoeducation studies, with one study showing improvements in QOL in females only (Thompson et al., 2013), and one showing no improvements in QOL (Wiseman et al., 2016). Physical, functional, (De Barros et al., 2018), emotional well-being, and role limitation (Conwill et al., 2014) QOL domains showed improvement with CBT-based group therapies. However, overall QOL scores showed no significant improvements. Quality of life improved in participants with PNES who received multimodal group psychotherapy, but only in the mental health domain (Metin et al., 2013). Improvements were not seen in other QOL domains. Quality of life did not improve in subjects with PNES who participated in a self-help stress management program (Novakova et al., 2019). Quality of life was not assessed in prolonged exposure therapy, psychodynamic interpersonal therapy, group DBT-based therapy, group psychoeducation, multimodal individual psychotherapies, or complementary and alternative medicine therapies.

Discussion

Several treatment modalities showed improvements in QOL in patients with PNES. Quality of life was assessed most in CBT-based therapies and improved in both individual and group settings. As was the case with seizure frequency outcomes, psychoeducation alone is not an effective way to improve QOL in the PNES population. Unfortunately, QOL was not measured in all studies, and the effects of several nonpharmacologic therapies on QOL are unknown. It is important to note that QOL can be improved in the absence of seizure frequency reduction. In the largest intervention study in this review, Goldstein et al. (2020) reported improved QOL in patients with PNES receiving CBT without an accompanying significant decrease in seizure frequency. This suggests that clinical signs are not the only indicators of meaningful change in the context of PNES treatment. Researchers and healthcare providers may form a more complete picture of a patient’s overall health status by including subjective measures such as QOL as an outcome of interest.

References

Addington-Hall, J., & Kalra, L. (2001). Who should measure quality of life? *BMJ, 322*(7299), 1417-1420. https://dx.doi.org/10.1136%2Fbmj.322.7299.1417

Baslet, G., Ehlert, A., Oser, M., & Dworetsky, B. A. (2020). Mindfulness-based therapy for psychogenic nonepileptic seizures. *Epilepsy & Behavior, 103*, 106534. https://doi.org/10.1016/j.yebeh.2019.106534

Cobb, S. J., Vaughn, B. V., & Sagherian, K. (2022). Nonpharmacologic interventions and seizure frequency in patients with psychogenic nonepileptic seizures: An integrative review. *Journal of the American Psychiatric Nurses Association*. Advance online publication. https://doi.org/10.1177/10783903221107637

Conwill, M., Oakley, L., Evans, K., & Cavanna, A. E. (2014). CBT-based group therapy intervention for nonepileptic attacks and other functional neurological symptoms: A pilot study. *Epilepsy & Behavior, 34*, 68-72. https://doi.org/10.1016/j.yebeh.2014.03.012

De Barros, A. C. S., Romano Furlan, A. E., Neves Marques, L. H., & De Araújo Filho, G. M. (2018). Effects of a psychotherapeutic group intervention in patients with refractory mesial temporal lobe epilepsy and comorbid psychogenic nonepileptic seizures: A nonrandomized controlled study. *Seizure, 58*, 22-28. https://doi.org/10.1016/j.seizure.2018.03.023

De Negri Filho, A. (2008). A human rights approach to quality of life and health: Applications to public health programming. *Health and Human Rights, 10*(1), 93-101. https://www.hhrjournal.org/2013/09/a-human-rights-approach-to-quality-of-life-and-health-applications-to-public-health-programming-2/

Goldstein, L. H., Robinson, E. J., Mellers, J. D. C., Stone, J., Carson, A., Reuber, M., Meford, N., McCrone, P., Murray, J., Richardson, M. P., Pilecka, I., Eastwood, C., Moore, M., Mosweu, I., Perdue, I., Landau, S., & Chalder, T. (2020). Cognitive behavioural therapy for adults with dissociative seizures (CODES): A pragmatic, multicentre, randomized controlled trial. *The Lancet Psychiatry, 7*(6), 491-505. https://doi.org/10.1016/s2215-0366(20)30128-0

Jones, B., Reuber, M., & Norman, P. (2016). Correlates of health-related quality of life in adults with psychogenic nonepileptic seizures: A systematic review. *Epilepsia, 57*(2), 171-181. https://doi.org/10.1111/epi.13268

LaFrance, W. C., Jr., Baird, G. L., Barry, J. J., Blum, A. S., Webb, A. F., Keitner, G. I., Machan, J. T., Miller, I., Szaflarski, J. P., & NES Treatment Trial (NEST-T) Consortium. (2014). Multicenter pilot treatment trial for psychogenic nonepileptic seizures: a randomized clinical trial. *JAMA Psychiatry, 71*(9), 997-1005. https://doi.org/10.1001/jamapsychiatry.2014.817

LaFrance, W. C., Jr., Ho, W. L. N., Bhatla, A., Baird, G. L., Atalib, H. H., & Godleski, L. (2020). Treatment of psychogenic nonepileptic seizures (PNES) using video telehealth. *Epilepsia. 61*(11), 2572-2582. https://doi.org/10.1111/epi.16689

Meeberg, G. A. (1993). Quality of life: A concept analysis. *Journal of Advanced Nursing, 18*(1), 32-38. https://doi.org/10.1046/j.1365-2648.1993.18010032.x

Metin, S. Z., Ozmen, M., Metin, B., Talasman, S., Yeni, S. N., & Ozkara, C. (2013). Treatment with group psychotherapy for chronic psychogenic nonepileptic seizures. *Epilepsy & Behavior, 28*(1), 91-94. https://doi.org/10.1016/j.yebeh.2013.03.023

Novakova, B., Harris, P. R., Rawlings, G. H., & Reuber, M. (2019). Coping with stress: A pilot of a self-help study of a self-help stress management intervention for patients with epileptic or psychogenic nonepileptic seizures. *Epilepsy & Behavior, 94*, 169-177. https://doi.org/10.1016/j.yebeh.2019.03.002

Post, M. W. M. (2014). Definitions of quality of life: What has happened and how to move on. *Topics in Spinal Cord Injury Rehabilitation, 20*(3), 167-180. https://doi.org/10.1310%2Fsci2003-167

Reuber, M., Mitchell, A. J., Howlett, S., & Elger, C. E. (2005). Measuring outcome in psychogenic nonepileptic seizures: How relevant is seizure remission? *Epilepsia, 46*(11), 1788-1795. https://doi.org/10.1111/j.1528-1167.2005.00280.x

Thompson, N., Connelly, L., Peltzer, J., Nowack, W. J., Hamera, E., & Hunter, E. E. (2013). Psychogenic nonepileptic seizures: A pilot study of a brief educational intervention. *Perspectives in Psychiatric Care, 49*(2), 78-83. https://doi.org/10.1111/j.1744-6163.2012.00353.x

Tolchin, B., Baslet, G., Martino, S., Suzuki, J., Blumenfeld, H., Hirsch, L. J., Altalib, H., & Dworetzky, B. A. (2020). Motivational interviewing techniques to improve psychotherapy adherence and outcomes for patients with psychogenic nonepileptic seizures. *The Journal of Neuropsychiatry and Clinical Neurosciences, 32*(2), 125-131. https://doi.org/10.1176/appi.neuropsych.19020045

Tolchin, B., Dworetzky, B. A., Martino, S., Blumenfeld, H., Hirsch, L. J., & Baslet, G. (2019). Adherence with psychotherapy and treatment outcomes for psychogenic nonepileptic seizures. *Neurology, 92*(7), e675-e679. https://doi.org/10.1212/wnl.0000000000006848

Wiseman, H., Mercer, G., Martin, R. C., & Reuber, M. (2018). Health-related quality of life: Utility and limitations in patients with psychogenic nonepileptic seizures. In W. C. Lafrance, Jr., & S. C. Schachter (Eds.), *Gates and Rowan's nonepileptic seizures* (4th ed., pp. 165-177). Cambridge University Press.

Wiseman, H., Mousa, S., Howlett, S., & Reuber, M. (2016). A multicenter evaluation of a brief manualized psychoeducation intervention for psychogenic nonepileptic seizures delivered by health professionals with limited experience in psychological treatment. *Epilepsy & Behavior, 63*, 50-56. https://doi.org/10.1016/j.yebeh.2016.07.033

Chapter IV: Sleep Quality, Quality of Life, and Seizure Frequency in Patients with Psychogenic Nonepileptic Seizures

This manuscript (Scholarly Paper #3) will be submitted to *Epilepsy & Behavior* for publication.

Abstract

Background: Sleep problems are common in the general population. If left untreated, they may lead to short- and long-term health problems including poor quality of life (QOL) and worsened somatic symptoms. Patients with psychogenic nonepileptic seizures (PNES) report high rates of sleep problems. Yet, poor sleep quality is rarely explored in relation to QOL and the frequency of seizures in this patient group.

Aim: This cross-sectional study aimed to explore the relationships between sleep quality, QOL, and seizure frequency in patients with PNES. A secondary aim was to identify influencing factors that predicted QOL and seizure frequency.

Methods: Data from 201 participants with PNES were collected online between April and May 2022. The online survey included a section on sociodemographic and health characteristics, measures for sleep quality (measured by the Pittsburgh Sleep Quality Index-PSQI), quality of life (measured by the Short Form Survey-12 version 2) and frequency of seizures. Hierarchical multiple linear regression and negative binomial regression analyses were conducted to explore the proposed relationships.

Results: Most participants (93.5%) were classified as “poor sleepers” based on the PSQI scores. Poor sleep quality was associated with decreased physical ($p < .001$) but not mental QOL. Overall sleep quality was not associated with seizure frequency; however, the use of sleep medications significantly increased the frequency of seizures ($p = .004$). Patients with increased psychological distress had decreased mental QOL and increased and increased incidence risk for having frequent seizures. Other influencing factors such as employment status and total number of years with PNES were significantly related to seizure frequency.

Conclusions: Our findings suggest the proper evaluation and treatment of sleep problems, as well as for psychological distress to improve the QOL and seizure frequency in this patient population.

Key words. sleep; psychogenic seizures, quality of life, PNES, patients

Sleep disorders affect around 70 million Americans and result in significant yearly healthcare costs (Centers for Disease Control and Prevention [CDC], 2022a). Sleep disorders may disrupt the quality, duration, or timing of sleep and consequently interfere with daily functioning (CDC, 2022b). These disorders impact the physical and mental health of individuals and predispose them to long-term health problems like cardiovascular, metabolic, autoimmune, and psychiatric diseases (Dopheide, 2020; Grandner et al., 2012; Medic et al., 2017). Individuals with sleep disorders also report poor quality of life (QOL), particularly in the physical and mental health and vitality domains (Lee et al., 2009).

In the clinical population, patients with psychogenic nonepileptic seizures (PNES)—a functional neurological disorder—experience seizures similar to epileptic seizures, but without the electroencephalographic (EEG) changes to correspond with the symptoms (LaFrance et al., 2016). A small body of research shows high rates of self-reported sleep problems in the PNES population with the most common being the disorder of insomnia. Studies have shown that 70-89% of patients with PNES report a clinically significant sleep disorder (Graham & Kyle, 2017; Latreille et al., 2018; Wilkins et al., 2018; Zhang et al., 2009), which is higher than the general population including patients with epilepsy (Ohayon, 2011). In patients with PNES, sleep disorders are associated with worse somatic symptoms (Latreille et al., 2019), anxiety and depression (Erickson et al., 2019), and functional impairment (Graham & Kyle, 2017). However, there is poor understanding about how these sleep problems may influence the QOL and seizure frequency of patients with PNES.

Background

Sleep disorders include problems with initiating and maintaining sleep (insomnias), excessive sleepiness (hypersomnias), sleep stage dysfunction (parasomnias), and sleep-wake schedules (Cormier, 1990). Little is known about the causes of sleep disturbances in patients with PNES. However, this group often suffers from comorbid psychiatric conditions that are associated with poor sleep including depression, anxiety, post-traumatic stress, and suicidality

(Sutton, 2014). The high rate of sleep disorders in patients with PNES may be partially attributed to common characteristics of the PNES population. The factors such as being female, unemployed, having a history of neurological diseases or psychological disorders have shown to be associated with increased risk of sleep disorders (Matheson & Hainer, 2017). Patients with PNES also deal with many co-morbidities that require treatment with medications such as antidepressants that can adversely affect sleep. Although many seek treatment for the seizures and comorbid psychiatric conditions, around 5% of patients seek specific treatment for sleep problems (Koffel et al., 2018). Therefore, it is likely that sleep problems are underassessed and undertreated in this population.

Clinical outcomes are increasingly being assessed with patient-reported measures. QOL is one of these self-reported subjective measures that has gained prominence in PNES because it indicates the impact of chronic diseases (Wiseman et al., 2018). Numerous studies have shown that patients with PNES have poor QOL often associated with depression, dissociation, somatic symptoms, escape-avoidance coping strategies, and family dysfunction (Jones et al., 2016). Although sleep disturbances negatively impact QOL in many patient populations, there is limited evidence and conflicting findings among studies in patients with PNES. Latreille et al. (2018) conducted a retrospective cohort study comparing 149 patients with PNES to controls with epilepsy and found that sleep disorders in patients with PNES were significantly related to poor QOL in all domains measured by the Quality of Life in Epilepsy-10 questionnaire (e.g., epilepsy effects, mental health, and role functioning). Contrary, an exploratory cross-sectional study by Erickson and colleagues (2019) in a small sample of 15 patients with PNES found no correlation between insomnia or hypersomnia and QOL. It is important to understand the relationship between sleep and QOL in PNES to maximize treatment effects that are aimed to improve QOL.

Seizure frequency is the most common PNES outcome measure assessed by healthcare providers and researchers. Data on the frequency of the seizures are particularly useful when comparing clinical manifestations of patients before and after receiving treatments. This measure is an important indicator of health status and presence of potentially debilitating symptoms, yet it is considered not comprehensive enough and limited to the occurrence of paroxysmal events. To the best of our knowledge, there have been no studies exploring the relationships between sleep disorders and seizure frequency in PNES. The current study addressed these gaps and examined the relationships between sleep problems, QOL, and seizure frequency in PNES.

Conceptual Framework

The conceptual framework of this study is based on the Theory of Unpleasant Symptoms (TOUS; Figure 4.1). The TOUS is a middle-range nursing theory that was developed to accurately represent the complex interactions between symptoms, influencing factors, and outcomes (Lenz et al., 1997). The theory is grounded in the interactive-integrative paradigm, which views reality as complex and contextual and persons as reciprocal interacting systems (Smith & Liehr, 2018). Changes in objective or subjective phenomena are probabilistic and associated with antecedent factor relationships (Newman, 1992). The TOUS assumes that there are commonalities in subjective symptom experiences in various conditions and contexts (Smith & Liehr, 2018). According to Lenz and Pugh (2018), there are three major concepts in the TOUS: the symptom(s), influencing factors, and performance outcomes. The TOUS uses Rhodes and Watson's (1987) definition of symptoms, conceptualized as "the perceived indicators of change in normal functioning as experienced by patients" (p. 242). The use of this definition means the TOUS focuses on the patient's subjective experience rather than observable clinical signs, and that researchers must use instruments that measure subjective experiences (Lenz and Pugh, 2018). The term "sleep disorder" indicates the presence of a sleep disturbance or sleep problem rather than a person's subjective experience of sleep. Therefore, sleep quality which is defined as "one's satisfaction of the sleep experience, integrating aspects of sleep initiation, sleep maintenance, sleep quantity, and refreshment upon awakening" (Kline, 2013). Therefore, sleep quality was the main symptom of interest in this study. Influencing factors are physiological, psychological, and situational antecedents that influence symptoms (Lenz et al., 2017). Possible influencing factors were sociodemographic characteristics, psychological symptoms, history of seizures, and perceived social support. The TOUS outcome is performance, which is conceptualized as the consequence of the symptom experience. Therefore, both QOL and seizure frequency were the outcomes of interest because of their clinical relevance and frequency of use as disease status indicators.

Objectives

The aim of this study was to explore the relationships between sleep quality, QOL, and seizure frequency in a sample of patients with PNES. We hypothesized that sleep quality would be associated with QOL and seizure frequency. A secondary aim was to identify what other physiological, psychological, and situational factors were related to QOL and seizure frequency in this population.

Methods

Study Design and Participants

The study used cross-sectional design. A convenience sample of patients who have been diagnosed with PNES were invited to participate in our online anonymous survey. Eligible participants were English-speaking adults (age 18 years or older) who lived in the United States and had been diagnosed with PNES by a healthcare provider. The exclusion criteria were if patients had a current diagnosis of comorbid epilepsy or were receiving cognitive behavioral therapy for insomnia (CBT-I). Participants were recruited from online social media platforms over a one-month period from April 15 to May 16, 2022. A recruitment flyer was posted to Facebook support group pages, Twitter, Instagram, and TikTok inviting eligible people to participate in the study. One reminder about the study was posted on most social media platforms after two weeks from the start of data collection.

To determine eligibility, participants answered screening questions at the beginning of the survey and were not allowed to proceed if any of the criteria were violated. All participants provided online consent for participation. The data were collected online via an anonymous Qualtrics survey software. After the screening questions to assess participant eligibility, the first page of the survey had all the elements of the informed consent.

The recommended sample size was 200 participants. This sample size was determined based on the results of our previous pilot study and a power analysis with power of 80%, alpha at 0.05 level, and beta 20%. The survey link received a total of 681 clicks of which 410 potential participants were ineligible and were excluded. After the initial screening, 7 did not proceed with the survey after providing consent and an additional 63 were excluded for providing only sociodemographic data. Therefore, the final analytic sample had 201 participants.

Ethical considerations

The institutional review board committee of the University of Tennessee Knoxville determined the following study as exempt.

Measures

The survey consisted of questions on sociodemographic characteristics and seizure frequency. It included reliable and valid instruments to measure sleep, QOL, psychological distress, stress, and perceived social support.

Sleep Quality

Sleep quality was operationalized by the Pittsburgh Sleep Quality Index (PSQI). The PSQI is the most widely used instrument to measure sleep quality (Smith & Wegener, 2003), and has been used in the PNES population (Graham & Kyle, 2017; Latreille et al., 2019; Phillips et al., 2013; Sivathamboo et al., 2019). The scale consisted of 19 items and measured sleep quality and disorders through 7 components: (1) subjective sleep quality, (2) sleep latency, (3) sleep duration, (4) habitual sleep efficiency, (5) sleep disturbances, (6) use of sleeping medication, and (7) daytime dysfunction (Buysse et al., 1989). The items 1-4 are free entry, and the remaining items were on 4-point Likert scale with responses from “not during the past month” to “three or more times a week”. Higher PSQI scores indicate poor sleep quality. The scale had good internal consistency where the Cronbach’s alpha was 0.83 (Devine et al., 2005). The validity of the scale has been established in the literature (Backhaus et al., 2002), and the scale is able to distinguish between “good sleepers” and “poor sleepers” based on a cutoff score of > 5 (Smith & Wegener, 2003). The Cronbach’s alpha in our sample was 0.72 indicating acceptable reliability.

Quality of Life

Quality of life in PNES was operationalized by the Short Form Survey-12 version 2 (SF-12v2). The SF-12v2 was created as part of the Medical Outcomes Study to assess QOL. It is the shortened version of the SF-36, but still includes the original eight domains: (1) physical functioning, (2) role limitations due to physical health, (3) role limitations due to emotional problems, (4) energy/fatigue, (5) emotional wellbeing, (6) social functioning, (7) pain, and (8) general health (Brazier & Roberts, 2004). Physical (PCS) and mental health (MCS) component summary scores were estimated using a proprietary scoring software license (QualityMetric Health Outcomes). Scores were determined using principal components analysis in which all eight health domain scores are weighted and used to calculate both the PCS and MCS (Maruish, 2012). The questions ranged from 3- to 6-point scales concerning problem frequency and bothersomeness over the last four weeks. Higher scores indicate better QOL and scores below 40 indicate impaired functioning in the respective domain (Maruish, 2012). The scales have good internal consistency with Cronbach’s alpha of 0.92 (PCS) and 0.88 (MCS; Maruish, 2012). The SF-12v2 covers the domains of the conceptual definition of QOL in the PNES population (Cobb & Beebe, 2022).

Seizure Frequency

Self-reported weekly seizure frequency was measured with the following question: How many seizures have you had in the past 7 days? Two additional questions about daily and monthly seizure frequency were used for validation purposes only (results not reported).
The influencing factors are potential confounders that are physiological, psychological and situational in nature.

Physiological factors. The variables were related to demographic characteristics (age in years, sex (male, female, prefer not to answer), race (White, Black, Asian, more than one race, others), history of trauma or abuse (physical, sexual, emotional, or other), age at PNES onset and total number of years with PNES.

Situational factors. The variables were marital status, income level, education level, employment status (working vs. not working) and disability status.

Psychological factors. The variables were psychological distress, perceived stress, and perception of social support.

Psychological distress.

The concept was operationalized by the Patient Health Questionnaire-4 (PHQ-4). The PHQ-4 is an ultra-brief, 4-item screening questionnaire that consists of two items for depressive symptoms and two items for anxiety symptoms (Löwe et al., 2010). The four questions are on 4-point Likert scale ranging from 0 (“not at all”) to 3 (“nearly every day”). The total composite score ranges from 0 to 12 with higher scores indicating greater psychological distress (Löwe et al., 2010). The Cronbach’s alpha in our sample was 0.86 indicating good reliability.

Perceived Stress

Stress was operationalized by the Perceived Stress Scale-10 (PSS-10). The PSS-10 is a short 10-item questionnaire used to measure perceived stress (Cohen et al., 1983). It is a commonly used instrument to measure general stress in varied populations (Lee, 2012). The participant is prompted to answer questions about feelings and thoughts over the past month.

Questions are answered on a 5-point Likert scale with responses ranging from 0 (“never”) to 4 (“very often”). The responses are summed (four questions are reverse-scored) to reveal a total psychological stress score ranging from 0-40. Higher scores indicate greater stress (Cohen & Janicki-Deverts, 2012). A review of studies using the PSS-10 by Lee (2012) reported good internal consistency (Cronbach’s alpha >0.70) and test-retest reliability (*r* >0.70) in varied international populations. The Cronbach’s alpha in our sample was 0.76 indicating acceptable reliability.

Perceived Social Support

Perceived social support was measured by the Interpersonal Support Evaluation List-12 (ISEL-12). The ISEL-12 is an instrument used to measure the perceived availability of social support resources (Cohen et al., 1985). It has the following three subscales: (a) tangible, the perceived availability of material aid; (b) appraisal, the perceived availability of someone to talk to; and (c) belonging, the perceived availability of someone to spend time with (Cohen et al., 1985). Each question is answered on a 4-point Likert scale from 1 (“definitely false”) to 4 (“definitely true”) with higher scores indicating greater perceived social support. Five of the items are reverse scored. It had good internal consistency with a Cronbach’s alpha of 0.83 (Payne et al., 2012). The ISEL test-retest correlation was 0.87 (Cohen et al., 1985). The Cronbach’s alpha in our sample was 0.88 indicating good reliability.

Data Analysis

Statistical analysis was conducted using SPSS v28. Descriptive statistics were calculated to summarize the characteristics of the sample. The frequencies and percentages were used for categorical variables, and means and standard deviations were used for continuous variables. The univariate normality of the continuous variables was assessed through histograms and Fisher’s skewness coefficient (acceptable range ± 1.5; Tabachnick & Fidell, 2013), and outliers were identified with boxplots and Z-scores (> ± 3.29; Kim, 2013). Bivariate relationships between QOL and seizure frequency outcomes, sleep quality, and other potential influencing factors were established using Student's t-tests, ANOVAs, and Pearson's correlations for normally distributed variables; or Kruskal-Wallis tests, Mann-Whitney U tests, and Spearman's correlations for skewed variables. The variables perceived stress and psychological distress were found to be highly correlated. To avoid collinearity in the regression models, we decided to remove perceived stress from further analyses.

Regression assumptions were tested for multivariate outliers, normality, correlations, linearity, and multicollinearity. Multivariate outliers were found to be non-influential in the models and were retained. Homoscedasticity of residuals was observed, and Variance Inflation Factor (VIF) and Tolerance values showed no signs of multicollinearity. The percentage of missingness in the analytic sample was < 1%. To avoid any case wise deletions, the expectation-maximization algorithm was used to impute missing item responses in SPSS.

Physical and Mental Component QOL

Hierarchical multiple linear regression was used to determine if sleep quality and other influencing factors are associated with physical and mental components of QOL. Confounders were retained in the statistically adjusted models if $p < .20$ or if they were of theoretical relevance. For both the physical and mental QOL analyses, the model building process started with sleep quality-(PSQI) as the main predictor of interest (model 1) and subsequent models were adjusted for physiological (model 2), psychological (model 3), and situational (model 4) factors.

Seizure Frequency

Weekly seizure frequency had over-dispersed count data. Negative binomial regression was used to determine if sleep quality and other influencing factors are associated with weekly seizure frequency. Confounders were retained in the statistically adjusted models if $p < .20$ or if they were of theoretical relevance. The model building process started with sleep quality (main predictor of interest) and subsequent models were adjusted for physiological (sex, age at PNES onset, total number of years with PNES), psychological (psychological distress), and situational (employment status, disability status, education level) factors.

Results

The demographic and clinical characteristics of the sample are summarized in Table 4.1. The majority of the sample were female (n = 176, 87.6%) between 18 and 72 years of age. On average, the onset of PNES was at the age of 28.5 years (*SD* = 12.87) and the participants had it for 7.2 years (*SD* = 8.19). Nearly two-thirds (n = 129, 64.2%) were not currently active in the workforce (e.g., unemployed, on disability, retired, on medical leave, student) and 57.7% (n = 116) did not have a college degree.

As shown in Table 4.2, the participants on average reported poor sleep quality (*M* = 12.66, *SD* = 4.40), moderate psychological distress (*M* = 7.26, *SD* = 3.51), and moderate stress (*M* = 24.19, *SD* = 5.60). The physical (*M* = 39.49, *SD* = 10.78) and mental (*M* = 35.14, *SD* = 9.45) component scores of the QOL fell below the acceptable threshold of 40 for normal functioning in the general population. In other words, participants had some impairment in physical and mental domains of QOL. The median weekly seizure frequency was 3 (min = 0, max = 350) seizures.

Quality of Life-Physical Component

Table 4.3 presents the results of the hierarchical regression model for physical QOL. The overall model was significant ($p < .001$) and explained 12.7% of the variance in physical QOL. Sleep quality was a significant predictor of physical QOL in model 1 and remained the only significant predictor in the final adjusted model after controlling subsequently for age and weekly seizure frequency in model 2, psychological distress and perceived social support in model 3, and employment status in model 4. Patients with poor sleep quality had significantly worsened physical QOL (*b* -.722, $p < .001$). None of the influencing factors were significantly related to physical QOL ($p \geq .130$).

Quality of Life-Mental Component

The overall model was significant (*p* < .001) and explained 18.5% of the variance in mental QOL. Sleep quality was not a significant predictor in model 1 and remained insignificant in the final adjusted model after controlling for total number of years with PNES and weekly seizure frequency in model 2; psychological distress in model 3; and marital status, income level, disability status, and treatment status in model 4 (Table 4.4). In the final adjusted model, psychological distress was the only significant influencing factor (*b* = -1.056, *p* < .001). Patients who experienced higher levels of psychological distress had lower significantly lower mental QOL.

Because sleep quality as measured by the total PSQI score was not significant (*p* = .929), we further examined the PSQI six subscales in relation to mental QOL. The results are shown in Table 4.S1. Similarly, all the PSQI subscales did not significantly predict mental QOL (*p* ≥ .105).

Seizure Frequency

In Table 4.5, we present the incidence rate ratios for sleep quality and weekly seizure frequency. At the bivariate level and when adjusted for physiological factors (model 2), poor sleep quality was significantly related to increased frequency of seizures. However, this significant relationship was not retained in the final model after adjusting further from psychological and situational factors (*p* = .144). Other significant influencing factors were the total number of years with PNES (*p* < .001), psychological distress (*p* = .001) and being employed (*p* = .003). With every additional year increase in the total number of years with PNES, the incidence rate of weekly seizures decreased by 6.0% [95% CI 0.91, 0.98]. As psychological distress increased by 1 point, the incidence rate of weekly seizures is expected to increase by 14% [95% CI 1.05, 1.23]. Compared to unemployed patients, employed patients with PNES are expected to have a rate 0.43 times lower for weekly seizures [95% CI 0.24, 0.74].

We further examined the PSQI six subscales in relation to seizure frequency. The results are shown in Table 4.S2. The use of sleep medications was positively related to weekly seizure frequency (*p* = .004). When compared to patients without the use of sleep medications, patients who reported using more sleep medications had an incidence rate 1.30 times greater for weekly seizures. The remaining PSQI subscales were not significant predictors of weekly seizure frequency.

Discussion

To best of our knowledge, this is the first study that explored the relationships between sleep quality, QOL and seizure frequency in a sample of PNES patients recruited from social media. Although sleep quality has not been studied extensively in this patient group, several studies have shown high rates of sleep disorders among the PNES population (Graham & Kyle, 2017; Latreille et al., 2018, 2019; Sivathamboo et al., 2019). Similarly, our study found that 93.5% of participants were considered “poor sleepers” based on the PSQI scores. Our findings partially supported the hypothesized relationships and showed that poor sleep quality was associated with the physical QOL but neither mental QOL nor seizure frequency among patients with PNES. The physical QOL encompassed areas related to physical functioning, bodily pain, and overall health (Maruish, 2012).

The use of sleep medications was related to the increased incidence rate of weekly seizures (Table 4.S2). This is an interesting finding that has not been previously reported in the literature. This finding at first is counterintuitive as the increased use of sleep medications would help with increased total sleep time and sleep quality and potentially have a protective effect against seizures. However, the residual effects of sleep medications such as cognitive impairment, daytime drowsiness, headaches, and gastrointestinal upset that are reported in 80% of users (Fitzgerald & Vietri, 2015) presents one possible explanation. Moreover, patients with residual symptoms generally suffer from depression and anxiety and it is known that psychogenic seizures are often provoked by emotional triggers. Therefore, the residual effects of sleep medications might trigger more seizures among patients with PNES. On the other hand, it is also possible that patients with PNES who already have a higher number of weekly seizures due to other factors already take more sleep medications.

Many psychotherapies used to treat PNES address factors related to both QOL and seizure frequency, including acceptance of diagnosis, illness perception, emotional processing, mood regulation, and coping strategies (Cobb et al., 2022). However, sleep has not been stated as a primary focus of PNES therapy. As sleep is a modifiable behavior, treating sleep problems can have positive effects on other health outcomes, and could potentially improve QOL and seizure frequency in patients with PNES. The effects of CBT-I have not been studied in the PNES population. CBT-I is recommended as first-line treatment for insomnia and has improved sleep quality (Qaseem et al., 2016) and QOL scores (Alimoradi et al., 2022) in several studies. CBT-I improves many sleep domains including sleep quality, sleep latency, total sleep time, sleep efficiency, and daytime functioning (Brasure et al., 2015). There are several components of CBT-I: sleep education, sleep restriction, stimulus control, cognitive restructuring, sleep hygiene, and relaxation techniques (Williams et al., 2013). It has been shown to be an effective add-on treatment for people with mental health disorders and comorbid sleep problems (Hertenstein et al., 2022). CBT-I is such an effective treatment because its multicomponent approach is more likely to target predisposing, precipitating, and perpetuating factors that contribute to poor sleep. Additionally, CBT-I has been shown to improve subjective sleep quality in adults with insomnia (Rezaie et al., 2018); therefore, it may improve perception of sleep quality in patients with PNES. Future studies are needed to explore the effects of CBT-I on sleep quality and outcomes in PNES.

Regarding influencing factors, this study showed that psychological distress was related to worse mental QOL and seizure frequency. The link between psychological distress and QOL in patients with PNES is well-established in the literature (Gagny et al., 2021). However, the relationship between psychological distress and seizure frequency in this patient population has received less attention. McKenzie et al. (2010) found that patients with PNES who had anxiety and depression were 2.32 times less likely to attain short-term seizure freedom. More than two decades age, Kanner et al. (1999) had found a higher rates of depression in patients with PNES who had not achieved seizure freedom. It was postulated that depression and seizure frequency in PNES may have a bidirectional relationship similar to epilepsy since there is some evidence of improved seizure frequency when patients with PNES were taking the antidepressant sertraline (Walsh et al., 2018). However, one limitation of the study was not being sufficiently powered to show treatment effects. In our study, the findings suggest that psychological distress is an important factor not just in mental QOL but also in the frequency of seizures experienced in patients with PNES. Many psychotherapies that are used to treat PNES target psychological distress and are known to improve symptoms. When patients with PNES have comorbid sleep disorders, CBT-I may be a beneficial add-on therapy since CBT-I has been shown to be effective in improving psychological distress too (Takano et al., 2016; Yamamoto et al., 2016). In addition to psychological distress, few other influencing factors were related to seizure frequency. Our study found that as the total number of years with PNES increased, the incidence rate of weekly seizures decreased. These results are in line with other studies in the literature that assessed long-term seizure outcomes and found that patients with PNES had fewer episodes of seizures or were completely free from seizures with time (Asadi-Pooya et al., 2019). Finally, our study showed that being employed was associated with lower incidence of weekly seizures (Table 4.5). Several studies have reported high unemployment in patients with PNES (Cobb et al., 2022), which is also associated with lower socioeconomic status and more reliance on government assistance (Jennum et al., 2019). Possibly, patients with PNES could benefit from therapies that include maintenance of daily functioning and job retention as part of their therapeutic goals (Asadi-Pooya et al., 2021). However, it is unclear if being employed had a protective effect against seizures, or if PNES patients with infrequent seizures were able to remain employed.

Limitations

There are several limitations in this study. Because participation was anonymous, the diagnosis of PNES by a healthcare provider was self-reported by the participants and could not be verified by the researchers. While this may have led to the inclusion of participants without a proper diagnosis, it is much more likely that a person with seizure symptoms would misdiagnose themselves with epilepsy rather than PNES. Another limitation may be related to the operational definition of QoL in this population. Currently, there is no PNES-specific instrument to assess QOL and none of the QOL instruments have been validated among PNES patients in the literature (Wiseman et al., 2018). However, the SF-12v2 has been administered in many PNES studies including the largest treatment trial to date (Goldstein et al., 2020). Based on our conceptual definition of QoL in PNES, the domains covered by the SF-12v2 are appropriate for use here. Participants were asked to self-report seizure frequency in the past week which may have led to recall bias or underestimation of seizures. Though many researchers follow this approach, we recommend the use of seizure diaries in future studies. Regarding the external validity, the findings may not be generalizable to all patients with PNES in the United States because of the potential self-selection bias here. The convenience sample was not representative of the patients who either did not have access to or decided not to seek diagnostic and treatment services. While online recruitment is an effective way to engage hard-to-reach patient populations from diverse geographical locations, it can leave out patients from lower socioeconomic status or living in rural areas with limited internet access, and older adults with age-related barriers to technology use (Haase et al., 2021). Besides including people who searched for PNES support in online communities, this type of recruitment may have resulted in the inclusion of participants who were more distressed about their condition (Benedict et al., 2019), seeking support outside of the medical system, eager to share their experiences, and more likely to want to participate in research studies. Social media use is associated with poorer sleep quality (Scott & Woods, 2019), as well as higher levels of extroversion, neuroticism, and openness (Kim et al., 2014), and patients with these traits may have been overrepresented in this study. Finally, this study used a cross-sectional design where the relationships are associative in nature and do not indicate directionality nor causality. As this study is the first to show relationships between sleep quality and physical QOL and sleep medication use and seizure frequency in PNES, the results are interpreted with caution and need to be replicated in future research with representative samples. Despite these limitations, the methodological approach was appropriate here to explore the proposed relationships and improved our understanding of symptomology in PNES particularly in the areas related to sleep quality, QOL, and seizure frequency.

Conclusions

This study found that sleep quality was significantly related to physical QOL and that the use of sleep medications increased the risk for seizure episodes in a sample of adults with PNES. Sleep problems are a common complaint among this patient group and are often not addressed. Healthcare providers use seizure frequency and QOL as indicators of PNES clinical progression and treatment effects, and these outcomes may be improved by correcting sleep quality issues. Possible areas for future research include the effects of add-on sleep therapies such as CBT-I on sleep quality, and seizure and QOL outcomes in PNES, and exploration of prescribed and over-the-counter sleep medication use in patients with PNES.

Implications for Nursing

Sleep disorders cannot be addressed unless a healthcare provider assesses for them. Given the prevalence of sleep problems in the PNES population, sleep should be routinely assessed by healthcare providers. If sleep problems are suspected to be caused by unhelpful sleep-related behaviors or beliefs, patients should be referred for appropriate treatment. While CBT-I is the first-line treatment for insomnia, it is underutilized due to clinician, patient, and systemic barriers (Koffel et al., 2018). One prominent barrier is lack of access to trained CBT-I clinicians. As of 2015, the United States only had 206 CBT-I clinicians credentialed by the American Board of Sleep Medicine (ABSM), most of whom were in the largest U.S. cities (Thomas et al., 2016). However, one does not have to be an ABSM-certified clinician to provide CBT-I. Master's-level advanced practice providers like nurse practitioners (NPs) are eligible to be trained in CBT-I. According to Fields et al. (2013), several studies have shown significant sleep improvements in patients who received CBT-I from NPs, including primary care NPs who were not certified as psychiatric-mental health nurse practitioners (PMHNPs). The utilization of nurses in the delivery of CBT-I may help improve access to appropriate treatment in the PNES population. Furthermore, NPs should be aware of the association between sleep medication use and increased incidence of weekly seizures in patients with PNES.

References

Alimoradi, Z., Jafari, E., Broström, A., Ohayon, M. M., Lin, C.-Y., Griffiths, M. D., Blom, K., Jernelöv, S., Kaldo, V., Pakpour, A. H. (2022). Effects of cognitive behavioral therapy for insomnia (CBT-I) on quality of life: A systematic review and meta-analysis. *Sleep Medicine Review, 64*, Article 101646. https://doi.org/10.1016/j.smrv.2022.101646

Asadi-Pooya, A. A., Bahrami, Z., & Homayoun, M. (2019). Natural history of patients with psychogenic nonepileptic seizures. *Seizure, 66*, 22-25. https://doi.org/10.1016/j.seizure.2019.02.006

Asadi-Pooya, A. A., Brigo, F., Lattanzi, S., D'Alessio, L., Daza-Restrepo, A., Calle-Lopez, Y., Hingray, C., Alsaadi, T., Mesraoua, B., Gigineishvilli, D., Kutlubaev, M. A., Yaghmoor, B. E., Aljandeel, G. B., Sarudiansky, M., Scévola, L., Contreras, G., & Lozada, M. E. (2021). Working restrictions and disability benefits eligibility in patients with functional (psychogenic) seizures: An international survey of physicians' opinions. *Epilepsy & Behavior, 115*, Article 107678. https://doi.org/10.1016/j.yebeh.2020.107678

Backhaus, J., Junghanns, K., Broocks, A., Riemann, D., & Hohagen, F. (2002). Test-retest reliability and validity of the Pittsburgh Sleep Quality Index in primary insomnia. *Journal of Psychosomatic Research, 53*(3), 737-740. https://doi.org/10.1016/s0022-3999(02)00330-6

Benedict, C., Hahn, A. L., Diefenbach, M. A., & Ford, J. S. (2019). Recruitment via social media: Advantages and potential biases. *Digital Health, 5*, 1-11. http://dx.doi.org/10.1177/2055207619867223

Brasure, M., MacDonald, R., Fuchs, R. Olson, C. M., Carlyle, M., Diem, S., Koffel, E., Khawaja, I. S., Ouellette, J., Butler, M., Kane, R. L., & Wilt, T. J. (2015). *Management of insomnia: Comparative effectiveness review number 159*. Agency for Healthcare Research and Quality. https://www.ncbi.nlm.nih.gov/books/NBK343503/pdf/Bookshelf_NBK343503.pdf

Brazier, J., & Roberts, J. (2004). The estimation of a preference-based measure of health from the SF-12. *Medical Care, 42*(9), 851–859. https://doi.org/10.1097/01.mlr.0000135827.18610.0d

Buysse, D., Reynolds, C., Monk, T., Berman, S., & Kupfer, D. (1989). The Pittsburgh Sleep Quality Index: A new instrument for psychiatric practice and research. *Psychiatry Research, 28*(2), 193–213. https://doi.org/10.1016/0165-1781(89)90047-4

Centers for Disease Control and Prevention. (2022a). *About our program: Sleep and sleep disorders*. https://www.cdc.gov/sleep/about_us.html

Centers for Disease Control and Prevention. (2022b). *Key sleep disorders: Sleep and sleep disorders*. https://www.cdc.gov/sleep/about_sleep/key_disorders.html

Cobb, S. J., & Beebe, L. H. (2021). Quality of life in psychogenic nonepileptic seizures: An evolutionary concept analysis. *Issues in Mental Health Nursing,* 43(8), 730-736. https://doi.org/10.1080/01612840.2022.2035026

Cobb, S. J., Vaughn, B. V., & Sagherian, K. (2022). Nonpharmacologic interventions and seizure frequency in patients with psychogenic nonepileptic seizures: An integrative review. *Journal of the American Psychiatric Nurses Association*. Advance online publication. https://doi.org/10.1177/10783903221107637

Cohen, S., & Janicki-Deverts, D. (2012). Who’s stressed? Distributions of psychological stress in the United States in probability samples from 1983, 2006, and 2009. *Journal of Applied Social Psychology, 42*(6), 1320-1334. https://doi.org/10.1111/j.1559-1816.2012.00900.x

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior, 24*(4), 385-396. https://doi.org/10.2307/2136404

Cohen, S., Mermelstein, R., Kamarck, T., & Hoberman, H. M. (1985). Measuring the functional components of social support. In I. G. Sarason, & B. R. Sarason (Eds.), *Social support: Theory, research, and applications* (pp. 73-94). Martinus Niijhoff. https://doi.org/10.1007/978-94-009-5115-0

Cormier, R. E. (1990). Sleep disturbances. In H. K. Walker, W. D. Hall, & J. W. Hurst (Eds.), *Clinical methods: The history, physical, and laboratory examinations* (3rd ed., pp. 398-403). Butterworths.

Dopheide, J. A. (2020). Insomnia overview: Epidemiology, pathophysiology, diagnosis, monitoring, and nonpharmacologic therapy. *The American Journal of Managed Care, 26*, S76-S84. https://doi.org/10.37765/ajmc.2020.42769

Devine, E. B., Hakim, Z., & Green, J. (2005). A systematic review of patient-reported outcome instruments measuring sleep dysfunction in adults. *Pharmacoeconomics, 23*(9), 889-912. https://doi.org/10.2165/00019053-200523090-00003

Erickson, J., Fan, J., Roth, H., Shin, H. W., Wabulya, A., Ngo, L., Hinn, A., & Vaughn, B. (2019). Sleep complaints in patients with psychogenic non-epileptic seizures. *SLEEP, 42*(1), A380. https://doi.org/10.1093/sleep/zsz067.943

Fields, B. G., Schutte-Rodin, S., Perlis, M. L., & Myers, M. (2013). Master's-level practitioners as cognitive behavioral therapy for insomnia providers: An underutilized resource. *Journal of Clinical Sleep Medicine, 9*(10), 1093-1096. https://dx.doi.org/10.5664%2Fjcsm.3096

Fitzgerald, T., & Vietri, J. (2015). Residual effects of sleep medications are commonly reported and associated with impaired patient-reported outcomes among insomnia patients in the United State. *Sleep Disorders, 2015*, Article 607148. https://doi.org/10.1155%2F2015%2F607148

Gagny, M., Grenevald, L., El-Hage, W., Chrusciel, J., Sanchez, S., Schwan, R., Klemina, I., Biberon, J., de Toffol, B., Thiriaux, A., Visseaux, J. F., Martin, M. L., Meyer, M., Maillard, L., & Hingray, C. (2021). Explanatory factors of quality of life in psychogenic non-epileptic seizure. *Seizure, 84*, 6-13. https://doi.org/10.1016/j.seizure.2020.10.028

Goldstein, L. H., Robinson, E. J., Mellers, J. D. C., Stone, J., Carson, A., Reuber, M., Meford, N., McCrone, P., Murray, J., Richardson, M. P., Pilecka, I., Eastwood, C., Moore, M., Mosweu, I., Perdue, I., Landau, S., & Chalder, T. (2020). Cognitive behavioural therapy for adults with dissociative seizures (CODES): A pragmatic, multicentre, randomized controlled trial. *The Lancet Psychiatry, 7*(6), 491-505. https://doi.org/10.1016/s2215-0366(20)30128-0

Graham, C. D., & Kyle, S. D. (2017). A preliminary investigation of sleep quality in functional neurological disorders: Poor sleep appears common, and is associated with functional impairment. *Journal of the Neurological Sciences, 378*, 163-166. http://dx.doi.org/10.1016/j.jns.2017.05.021

Grandner, M. A., Jackson, N. J., Pigeon, W. R., Gooneratne, N. S., & Patel, N. P. (2012). State and regional prevalence of sleep disturbance and daytime fatigue. *Journal of Clinical Sleep Medicine, 8*(1), 77-86. https://doi.org/10.5664/jcsm.1668

Haase, K. R., Cosco, T., Kervin, L., Riadim I, & O'Connell, M. E. (2021). Older adults' experiences with using technology for socialization during the COVID-19 pandemic: Cross-sectional survey study. *Journal of Medical Internet Research Aging, 4*(2), Article e28010. https://doi.org/10.2196%2F28010

Hertenstein, E., Trinca, E., Wunderlin, M., Schneider, C. L., Züst, Fehér, K. D., Su, T., Straten, A. V., Berger, T., Baglioni, C., Johann, A., Spiegelhalder, K., Riemann, D., Fiege, B., & Nissen, C. (2022). Cognitive behavioral therapy for insomnia in patients with mental disorders and comorbid insomnia: A systematic review and meta-analysis. *Sleep Medicine Reviews, 62*, Article 101597. https://doi.org/10.1016/j.smrv.2022.101597

Jennum, P., Ibsen, R., & Kjellberg, J. (2019). Welfare consequences for people diagnosed with nonepileptic seizures: A matched nationwide study in Denmark. *Epilepsy & Behavior, 98*, 59-65. https://doi.org/10.1016/j.yebeh.2019.06.024

Jones, B., Reuber, M., & Norman, P. (2016). Correlates of health-related quality of life in adults with psychogenic nonepileptic seizures: A systematic review. *Epilepsia, 57*(2), 171-181. https://doi.org/10.1111/epi.13268

Kanner, A. M., Parra, J., Frey, M., Stebbins, G., Pierre-Louis, S., & Iriarte, J. (1999). Psychiatric and neurologic predictors of psychogenic pseudoseizure outcome. *Neurology, 53*(5), 933-938. https://doi.org/10.1212/wnl.53.5.933

Kim, H.-Y. (2013). Statistical notes for clinical researchers: Assessing normal distribution (2) using skewness and kurtosis. *Restorative Dentistry and Endodontics, 38*(1), 52-54. https://doi.org/10.5395%2Frde.2013.38.1.52

Kim, K.-S., Sin, S.-C. J., & Tsai, T.-I. (2014). Individual differences in social media use for information seeking. *The Journal of Academic Librarianship, 40*(2), 171–178. https://doi.org/10.1016/j.acalib.2014.03.001

Kline, C. (2013). Sleep quality. In M.D. Gellman, & J. R. Turner (Eds.), *Encyclopedia of Behavioral Medicine* (pp. 1811-1813). Springer. https://doi.org/10.1007/978-1-4419-1005-9_849

Koffel, E., Bramoweth, A. D., & Ulmer, C. S. (2018). Increasing access to and utilization of cognitive behavioral therapy for insomnia (CBT-I): A narrative review. *Journal of General Internal Medicine, 33*(6), 955-962. https://doi.org/10.1007/s11606-018-4390-1

LaFrance, W. C., Jr., Ranieri, R., & Blum, A. S. (2016). Nonepileptic seizures – Objective phenomena. In M. Hallett, J. Stone, & A. Carson (Eds.), *Handbook of clinical neurology: Vol.139. Functional neurologic disorders* (3rd ed., pp. 297-304). Elsevier. http://dx.doi.org/10.1016/B978-0-12-801772-2.00026-6

Latreille, V., Baslet, G., Sarkis, R., Pavlova, M., & Dworetzky, B. A. (2018). Sleep in psychogenic nonepileptic seizures: Time to raise a red flag. *Epilepsy & Behavior, 86*, 6-8. https://doi.org/10.1016/j.yebeh.2018.07.001

Latreille, V., Dworetzky, B. A., Baslet, G., & Pavlova, M. (2019). Sleep disturbances in patients with psychogenic non-epileptic seizures: Is it all subjective? A prospective pilot study of sleep-wake patterns. *Seizure, 65*, 124-128. https://doi.org/10.1016/j.seizure.2019.01.016

Lee, E.-H. (2012). Review of the psychometric evidence of the Perceived Stress Scale. *Asian Nursing Research, 6*, 121-127. http://dx.doi.org/10.1016/j.anr.2012.08.004

Lee, M., Choh, A. C., Demerath, E. W., Knutson, K. L., Duren, D. L., Sherwood, R. J., Sun, S. S., Chumlea, W. M. C., Towne, B., Siervogel, R. M., & Czerwinski, S. A. (2009). Sleep disturbance in relation to health-related quality of life in adults: The FELS longitudinal study. *Journal of Nutrition, Health, & Aging, 13*(6), 576-583. https://doi.org/10.1007%2Fs12603-009-0110-1

Lenz, E. R., & Pugh, L. C. (2018). Theory of Unpleasant Symptoms. In M. J. Smith, & P. R. Leihr (Eds.), *Middle range theory for nursing* (4th ed., pp. 179-214). Springer Publishing Company.

Lenz, E. R., Pugh, L. C., Milligan, R., & Gift, A. (2017). Unpleasant symptoms. In S. J. Peterson, & T. S. Bredow (Eds.), *Middle range theories: Application to nursing research and practice* (4th ed., pp. 67-77). Wolters Kluwer.

Lenz, E. R., Pugh, L. C., Milligan, R. A., Gift, A., & Suppe, F. (1997). The middle-range theory of unpleasant symptoms: An update. *Advances in Nursing Science, 19*(3), 14-27. https://doi.org/10.1097/00012272-199703000-00003

Löwe, B., Wahl, I., Rose, M., Spitzer, C., Glaesmer, H., Wingenfeld, K., Schneider, A., & Brähler, E. (2009). A 4-item measure of depression and anxiety: Validation and standardization of the Patient Health Questionnaire-4 (PHQ-4) in the general population. *Journal of Affective Disorders, 122*(1), 86–95. https://doi.org/10.1016/j.jad.2009.06.019

Maruish, M. E. (Ed.). (2012). *User’s manual for the SF-12v2 Health Survey* (3rd ed.). QualityMetric Incorporated.

Matheson, E., & Hainer, B. L. (2017). Insomnia: Pharmacologic therapy. *American Family Physician, 96*(1), 29-35. https://www.aafp.org/pubs/afp/issues/2017/0701/p29.html

McKenzie, P., Oto, M., Russell, A., & Duncan, R. (2010). Early outcomes and predictors in 260 patients with psychogenic nonepileptic attacks. *Neurology, 74*(1), 64-69. https://doi.org/10.1212/WNL.0b013e3181c7da6a

Medic, G., Wille, M., & Hemels, M. (2017). Short- and long-term health consequences of sleep disruption. *Nature and Science of Sleep, 9*, 151–161. https://doi.org/10.2147/nss.s134864

Newman, M. A. (1992). Prevailing paradigms in nursing. *Nursing Outlook, 40*(1), 10-13. https://pubmed.ncbi.nlm.nih.gov/1570217/

Ohayon, M. M. (2011). Epidemiological overview or sleep disorders in the general population. *Sleep Medicine Research, 2*(1), 1-9. https://doi.org/10.17241/smr.2011.2.1.1

Payne, T. J., Andrew, M., Butler, K. R., Wyatt, S. B., Dubbert, P. M., & Mosley, T. H. (2012). Psychometric evaluation of the Interpersonal Support Evaluation List – Short Form in the ARIC study cohort. *SAGE Open, 2*(3), 1-8. https://doi.org/10.1177%2F2158244012461923

Phillips, M. C. L., Costello, C. A., White, E. J., Smit, M., Carino, J., Strawhorn, A., Jackson, B., Kwan, P., French, C. R., Yerra, S. R., Tan, K. M., O'Brien, T. J., & Goldin, J. (2013). Routine polysomnography in an epilepsy monitoring unit. *Epilepsy Research, 105*, 401-404. http://dx.doi.org/10.1016/j.eplepsyres.2013.02.015

Qaseem, A., Kansagara, D., Forciea, M. A., Cooke, M., & Denberg, T. D. (2016). Management of chronic insomnia disorder in adults: A clinical practice guideline from the American College of Physicians. *Annals of Internal Medicine, 165*(2), 125–133. https://doi.org/10.7326/M15-2175

Rezaie, L., Fobian, A. D., McCall, W. V., & Khazaie, H. (2018). Paradoxical insomnia and subjective-objective sleep discrepancy: A review. *Sleep Medicine Reviews, 40*, 196-202. https://doi.org/10.1016/j.smrv.2018.01.002

Rhodes, V. A., & Watson, P. M. (1987). Symptom distress – The concept: Past and present.

Seminars in Oncology Nursing, 3(4), 242-247. https://doi.org/10.1016/s0749-2081(87)80014-1

Scott, H., & Woods, H. C. (2019). Understanding links between social media use, sleep and mental health: Recent progress and current challenges. *Current Sleep Medicine Reports, 5*, 141-149. https://doi.org/10.1007/s40675-019-00148-9

Sivathamboo, S., Farrand, S., Chen, Z., White, E. J., Pattichis, A., Hollis, C., Carino, J., Roberts, C. J., Minogue, T., Jones, N. C., Yerra, R., French, C., Perucca, P., Kwan, P., Velakoulis, D., O'Brien, T. J., & Goldin, J. (2019). Sleep-disordered breathing among patients admitted for inpatient video-EEG monitoring. *Neurology, 92*, e194-e204. https://doi.org/10.1212/WNL.0000000000006776

Smith, M. J., & Liehr, P. R. (2018). Understanding middle range theory by moving up and down the ladder of abstraction. In M. J. Smith, & P. R. Leihr (Eds.), *Middle range theory for nursing* (4th ed., pp. 15-32). Springer Publishing Company.

Smith, M. T., & Wegener, S. T. (2003). Measures of sleep: The Insomnia Severity Index, Medical Outcomes Study (MOS) Sleep Scale, Pittsburgh Sleep Diary (PDS), and Pittsburgh Sleep Quality Index (PSQI). *Arthritis Care & Research, 49*(5S), S184-S196. https://doi.org/10.1002/art.11409

Sutton, E. L. (2014). Psychiatric disorders and sleep issues. *Medical Clinics of North America, 98*(5), 1123-1143. https://doi-org.proxy.lib.utk.edu/10.1016/j.mcna.2014.06.009

Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics* (6th ed.). Pearson.

Takano, T., Isojima, M., Tanaka, M., Yamamoto, M., Sasaki, N., Somemura, H., Nakamura, S., Katsuragawa, S., & Tanaka, K. (2016). Effects of brief CBT-I on sleep quality and psychological distress in shift workers without the midnight shift. *Kitasato Medical Journal, 46*(2), 118-125. https://www.kitasato-u.ac.jp/ktms/kaishi/pdf/KMJ46-2/KMJ46-2p118-125.pdf

Thomas, A., Grandner, M., Nowakowski, S., Nesom, G., Corbitt, C., & Perlis, M. L. (2016).

Where are all the behavioral sleep medicine providers and where are they needed? A geographic assessment. *Behavioral Sleep Medicine, 14*(6), 687-698. https://dx.doi.org/10.1080%2F15402002.2016.1173551

Walsh, S., Levita, L., & Reuber, M. (2018). Comorbid depression and associated factors in PNES versus epilepsy: Systematic review and meta-analysis. *Seizure, 60*, 44-56. j.seizure.2018.05.014

Wilkins, S. S., Mesraoua, B., Palomo, G. A., Al Hail, H., Salam, A., Melikyan, G., Azar, N., Haddad, N., Uthman, B., Siddiqi, M., Elsheikh, L., Ali, M., Alrabi, A., Shuaib, A., Deleu, D., & Asadi-Pooya, A. A. (2018). Characteristics of patients with confirmed epilepsy and psychogenic nonepileptic seizures in Qatar. *Epilepsy & Behavior, 85*, 218-221. https://doi.org/10.1016/j.yebeh.2018.06.014

Williams, J., Roth, A., Vatthauer, K., & McCrae, C. S. (2013). Cognitive behavioral treatment of insomnia. *Chest, 143*(2), 554-565. https://doi.org/10.1378%2Fchest.12-0731

Wiseman, H., Mercer, G., Martin, R. C., & Reuber, M. (2018). Health-related quality of life: Utility and limitations in patients with psychogenic nonepileptic seizures. In W. C. Lafrance, Jr., & S. C. Schachter (Eds.), *Gates and Rowan's nonepileptic seizures* (4th ed., pp. 165-177). Cambridge University Press.

Yamamoto, M., Sasaki, N., Somemura, H., Nakamura, S., Kaneita, Y., Uchiyama, M., & Katsutoshi, T. (2016). Efficacy os sleep education program based on principles of cognitive behavioral therapy to alleviate workers' distress. *Sleep and Biological Rhythms, 14*, 211-219. https://doi.org/10.1007/s41105-015-0045-3

Zhang, Y.-C., Bromfield, E. B., Hurwitz, S., Nelson, A., & Sylvia, K. (2009). Comparison of outcomes of video/EEG monitoring between patients with epileptic seizures and those with psychogenic nonepileptic seizures. *Epilepsy & Behavior, 15*(3), 303-307. https://doi.org/10.1016/j.yebeh.2009.04.008

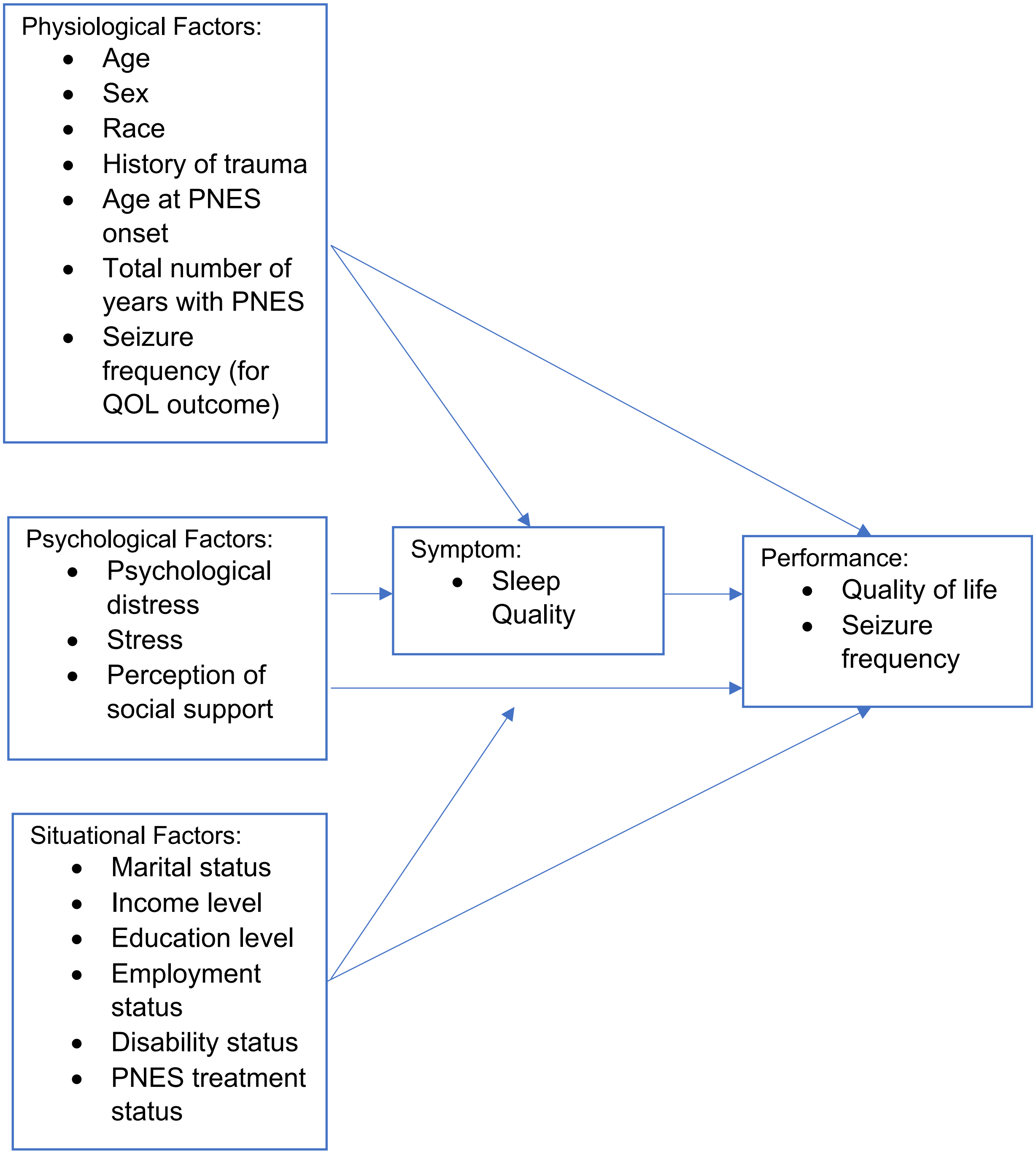

Figure 4.1: Conceptual Model Derived from the Theory of Unpleasant Symptoms

Note. PNES = psychogenic nonepileptic seizures, QOL = quality of life.

Table 4.1: Sociodemographic and Clinical Characteristics of the Sample (n = 201)

Characteristics	n (%)
Age in years	
Mean (SD)	35.82 (12.37)
Sex	
Female	176 (87.56)
Male	20 (9.95)
Prefer not to answer	5 (2.49)
Race	
White	177 (88.06)
Others (Black, Natives, Asian, more than one race)	24 (11.94)
Ethnicity	
Not of Hispanic origin	192 (95.52)
Hispanic origin	8 (4.00)
Marital status	
Not married	92 (45.77)
Married or with partner	109 (54.23)
Annual household income	
Less than $50,000	118 (59.00)
$50,000 or more	82 (41.00)
Education	
High school diploma or less	35 (17.41)
Some college, no degree	81 (40.30)
Associate degree	26 (12.93)
Bachelor’s degree	41 (20.40)
Master’s or Doctoral degree	18 (8.96)
Employment status	
Working (full- or part-time, or per diem)	72 (35.82)
Not working	129 (64.18)

Table 4.1 Continued

Disability status	
Receiving disability benefits	56 (27.86)
Not receiving disability benefits	145 (72.14)
History of abuse/trauma	
Yes	159 (79.10)
No	42 (20.90)
Abuse/trauma type	
Physical	92 (45.77)
Sexual	114 (56.72)
Emotional	140 (69.65)
Other	25 (12.44)
Age at PNES onset	
Mean (SD)	28.53 (12.87)
Total number of years with PNES	
Mean (SD)	7.17 (8.19)
Currently receiving treatment for PNES	
Yes	142 (70.65)
No	59 (29.35)
Treatment Type (n=142)	
Medications	93 (65.49)
Psychotherapy	98 (69.01)
Medical treatment	8 (3.98)
Complementary/alternative medicine or self-care	6 (4.23)
Receiving medication treatment only (n=142)	
Yes	39 (27.46)
No	103 (72.54)
Treatment length (in years, n=142), mean (SD)	3.59 (4.28)

Table 4.2: Characteristics of Sleep Quality, Quality of Life, Seizure Frequency, and Psychosocial Factors

Characteristics	***Mean (SD)***
Pittsburgh Sleep Quality Index (PSQI)	
Sleep quality	12.66 (4.40)
Seizure frequency (weekly)	
Md, min.-max.	3 (0-350)
Short Form-12 version 2 (SF-12v2)	
Physical aspect of quality of life	39.49 (10.78)
Mental aspect of quality of life	35.14 (9.46)
Patient Health Questionnaire-4 (PHQ-4)	
Psychological distress	7.26 (3.51)
Perceived Stress Scale-10 (PSS-10)	
Perceived stress	24.19 (5.60)
Interpersonal Support Evaluation List-12 (ISEL-12)	
Perceived social support	21.92 (7.86)

Table 4.3: Hierarchical Multiple Linear Regression Results for Sleep Quality and Physical Quality of Life

Parameter	Model 1	Model 2 Physiological	Model 3 Psychological	Model 4 Situational
	β [95% CI], *p*	β [95% CI], *p*	β [95% CI], *p*	β [95% CI], *p*
PSQI	-0.77 [-1.01, -0.45], < .001	0.72 [-1.05, 0.40], < .001	-0.72 [-1.08, 0.37], < .001	-0.77 [-1.08, 0.37), < .001
Covariates				
Age		-0.08 [-0.20, 0.04], .177	-0.08 [-0.20, 0.04], .189	-0.07 [-0.19, 0.05], .259
Seizure frequency		-0.03 [-0.07, 0.01], .081	-0.03 [-0.07, 0.01], .091	-0.03 [-0.07, 0.01], .130
PHQ-4			0.10 [-0.36, 0.57], .660	0.12 [-0.35, 0.58], .630
ISEL-12			0.09 [-0.10, 0.29], .357	0.08 [-0.11, 0.28], .404
Employment				
Not working				Ref
Working				1.52 [-1.56, 4.61], .332

Note. 95% CI = 95% confidence interval, ISEL-12 = Interpersonal Support Evaluation List-12, PHQ-4 = Patient Health Questionnaire-4, PSQI = Pittsburgh Sleep Quality Index.

Table 4.4: Hierarchical Multiple Linear Regression Results for Sleep Quality and Mental Quality of Life

Parameter	Model 1	Model 2 Physiological	Model 3 Psychological	Model 4 Situational
	β [95% CI], p	β [95% CI], p	β [95% CI], p	β [95% CI], p
PSQI	-0.28 [-0.52, 0.02], .065	-0.30 [-0.60, 0.00], .050	0.02 [-0.28, 0.33], .873	0.01 [-0.29, 0.32], .929
Covariates				
Total years with PNES		-0.07 [-0.24, 0.09], .373	-0.03 [-0.18, 0.12], .696	-0.02 [-0.18, 0.14], .802
Seizure frequency		0.01 [-0.02, 0.05], .499	0.03 [-0.01, 0.06], .091	0.03 [-0.01, 0.06], .107
PHQ-4			-1.09 [-1.48, -0.70], < .001	-1.06 [-1.45, -0.66], < .001
Marital status				
Not married				Ref
Married/with partner				-0.73 [-3.72, 2.25], .629
Annual income				
< $ 50 K				Ref
≥ $ 50 K				-1.58 [-4.55, 1.39], .295
Disability				
Not receiving				Ref
Receiving				-1.69 [-4.59, 1.21], .251

Table 4.4 Continued

Treatment	
No	Ref
Yes, on treatment	-1.03 [-3.79, 1.73], .464

Note. 95% CI = 95% confidence interval, ISEL-12 = Interpersonal Support Evaluation List-12, PHQ-4 = Patient Health Questionnaire-4, PSQI = Pittsburgh Sleep Quality Index.

Table 4.5: Negative Binomial Regression Results for Sleep Quality and Weekly Seizure Frequency

	Model 1	Model 2 Physiological	Model 3 Psychological	Model 4 Situational
Parameter	IRR [95% CI]	IRR [95% CI]	IRR [95% CI]	IRR [95% CI]
PSQI	1.08 [1.02, 1.14], .013	1.06 [1.00, 1.12], .048	1.03 [0.97, 1.10], .282	1.05 [0.98, 1.12], .144
Covariates				
Sex				
Male		Ref	Ref	Ref
Female		0.42 [0.17, 1.05], .062	0.48 [0.19, 1.20], .118	0.39 [0.15, 1.01], .053
Age at seizure onset		0.99 [0.97, 1.01], .309	1.00 [0.98, 1.02], .907	0.99 [0.98, 1.02], .901
Total years with PNES		0.95 [0.92, 0.99], .006	0.95 [0.92, 0.98], .002	0.94 [0.91, 0.98], < .001
PHQ-4			1.18 [1.09, 1.27], < .001	1.14 [1.05, 1.23], .001
Employment				
No				Ref
Yes				0.43 [0.24, 0.74], .003
Disability				
Not receiving				Ref
Receiving				1.09 [0.59, 2.02], .775

Table 4.5 Continued

Education	
High school diploma or less	Ref
Some college, no degree	0.47 [0.24, 0.92], .028
Associate degree	0.57 [0.23, 1.44], .238
Bachelor’s degree	0.60 [0.27, 1.33], .208
Master’s or Doctoral degree	1.24 [0.44, 3.50], .678

Note. 95% CI = 95% confidence interval, IRR = incidence rate ratio, PHQ-4 = Patient Health Questionnaire-4, PNES = psychogenic nonepileptic seizures, PSQI = Pittsburgh Sleep Quality Index.

Table 4.S1: Hierarchical Multiple Linear Regression Results for Sleep Quality Subscales and Mental Quality of Life

	Model 1	Model 2 Physiological	Model 3 Psychological	Model 4 Situational
Parameter	*β* [95% CI], *p*	*β* [95% CI], *p*	*β* [95% CI], *p*	*β* [95% CI], *p*
PSQI – sleep disturbance	-0.53 [-2.01, 1.75], .649	-0.70 [.2.99, 1.58], .546	-0.17 [-2.34, 1.99], .874	-0.32 [-2.52, 1.88], .775
PSQI – daytime dysfunction	-1.00 [-2.73, 0.72], .252	-1.19 [-2.93, 0.55], .179	0.50 [-1.27, 2.28], .576	0.59 [-1.21, 2.38], .552
PSQI – sleep quality	-1.28 [-3.16, 0.61], .184	-1.30 [-3.19, 0.58], .174	-0.24 [-2.07, 1.59], .796	-0.30 [-2.21, 1.60], .755
PSQI – sleep medications	-0.73 [-1.74, 0.29], .160	-0.82 [-1.84, 0.21], .117	-0.51 [-1.18, 0.47], .307	-0.42 [-1.40, 0.56], .401
Covariates				
Total years with PNES		-0.08 [-0.24, 0.08], .314	-0.3 [-0.19, 0.12], .663	-0.03 [-0.19, 0.13], .735
Seizure frequency		0.02 [-0.01, 0.06], .231	0.03 [-0.01, 0.07], .081	0.03 [-0.01, 0.06], .108
PHQ-4			-1.06 [-1.48, -0.64], < .001	-1.03 [-1.46, -0.60], < .001
Marital status				
Not married				Ref
Married/with partner				-0.85 [-3.86, 2.17], .580

Table 4.S1 Continued

Annual income	
< $ 50 K	Ref
≥ $ 50 K	-1.58 [-4.58, 1.42], .300
Disability	
Not receiving	Ref
Receiving	-1.38 [-4.33, 1.57], .358
Treatment	
No	Ref
Yes, on treatment	-1.10 [-3.96, 1.76], .449

Note. 95% CI = 95% confidence interval, PHQ-4 = Patient Health Questionnaire-4, PSQI = Pittsburgh Sleep Quality Index.

Table 4.S2: Negative Binomial Regression Results for Sleep Quality Subscales and Weekly Seizure Frequency

Parameter	Model 1	Model 2 Physiological	Model 3 Psychological	Model 4 Situational
	IRR [95% CI]	IRR [95% CI]	IRR [95% CI]	IRR [95% CI]
PSQI—sleep duration	0.85 [0.67, 1.08], .183	0.87 [0.69, 1.11], .272	0.91 [0.72, 1.15], .424	0.95 [0.75, 1.21], .667
PSQI – sleep disturbance	1.10 [0.73, 1.70], .632	0.96 [0.63, 1.46], .853	0.86 [0.57, 1.30], .477	0.82 [0.54, 1.26], .365
PSQI – daytime dysfunction	1.82 [1.28, 2.59], <. 001	1.92 [1.25, 2.73], < .001	1.61 [1.11, 2.33], .012	1.38 [0.98, 1.96], .066
PSQI – sleep quality	1.08 [0.76, 1.53], .675	1.05 [0.74, 1.50], .763	1.05 [0.75, 1.47], .785	1.11 [0.77, 1.59], .572
PSQI – sleep medications	1.36 [1.14, 1.62], < .001	1.34 [1.13, 1.60], < .001	1.28 [1.07, 1.52], .006	1.30 [1.09, 1.55], .004
Covariates				
Sex				
Male		Ref	Ref	Ref
Female		0.74 [0.29, 1.87], .524	0.76 [0.30, 1.91], .561	0.68 [0.26, 1.82], .447
Age at seizure onset		1.01 [0.99, 1.03], .452	1.01 [0.99, 1.03], .356	1.00 [0.98, 1.03], .656
Total years with PNES		0.96 [0.94, 1.00], .031	0.96 [0.93, 0.99], .009	0.95 [0.91, 0.98], .002
PHQ-4			1.11 [1.03, 1.21], .010	1.10 [1.02, 1.19], .020

Table 4.S2 Continued

Employment	
No	Ref
Yes	0.44 [0.25, 0.77], .004
Disability	
Not receiving	Ref
Receiving	1.19 [0.66, 2.13], .570
Education	
High school diploma or less	Ref
Some college, no degree	0.51 [0.26, 1.01], .954
Associate degree	0.66 [0.27, 1.62], .157
Bachelor’s degree	0.58 [0.27, 1.24], .363
Master’s or Doctoral degree	1.03 [0.35, 3.08], .052

Note. 95% CI = 95% confidence interval, IRR = incidence rate ratio, PHQ-4 = Patient Health Questionnaire-4, PNES = psychogenic nonepileptic seizures, PSQI = Pittsburgh Sleep Quality Index.

Chapter V: Conclusion

Patients with psychogenic nonepileptic seizures (PNES) present a unique challenge in healthcare because they are part of a medically complex, heterogenous patient group (Kerr et al., 2017). When these patients do have access to diagnostic and treatment services, they often become part of a healthcare system that is not conducive to recovery. Although there has been more research on PNES in recent years, there are still gaps in our understanding of the patients' lived experiences, symptoms, and outcomes. It is important to fill these gaps in knowledge so we as healthcare providers can create plans of care that are appropriate for patients with PNES.

From the beginning of the dissertation process, there were two outcomes of interest in patients with PNES: quality of life (QOL) and seizure frequency. The first step of this dissertation was to clarify the concepts of interest. Because seizure frequency is an easily defined count variable, it was not necessary to clarify the concept. Instead, the first manuscript of this dissertation provides a comprehensive concept analysis of QOL in PNES. The concept analysis clarified QOL concepts and provided an operational definition of QOL in the context of PNES. Quality of life in PNES was defined as "a subjective and dynamic feeling of well-being and satisfaction with life based on the person's lived experiences, perceptions of life, and abilities to manage PNES" (Cobb & Beebe, 2021).

The second manuscript provided a comprehensive review of the literature on nonpharmacologic interventions, seizure frequency (Chapter III: Part I), and QOL (Chapter III: Part II) in patients with PNES. This review showed that many psychotherapies can improve QOL and reduce seizure frequency in patients with PNES, particularly therapies that address multiple domains of the PNES experience such as triggers, stress, emotions, and illness behaviors. The review also showed that improvements may be seen in one outcome without significant change in the other outcome, which validates the need for inclusion of multiple outcomes when assessing disease status or the effectiveness of treatments. As the core elements of each psychotherapy included in the review were evaluated, it was discovered that most therapies addressed many of the antecedents and attributes of QOL in PNES that were identified in the concept analysis manuscript. However, one gap that was identified was that sleep quality was never stated as a topic of interest in the treatment plans. This led to the discovery that although patients with PNES report high rates of sleep disorders, there was a paucity of research on sleep topics in this patient group. More research was needed to understand the relationships between sleep quality and PNES outcomes like QOL and seizure frequency.

The third manuscript used a cross-sectional exploratory design to explore the relationships between sleep quality, QOL, and seizure frequency in a sample of patients with PNES; and to identify other physiological, psychological, and situational factors related to QOL and seizure frequency. It was hypothesized that sleep quality would be associated with quality of life and seizure frequency. The conceptual model was guided by the Theory of Unpleasant Symptoms (TOUS), which focuses on the connections between symptoms (sleep quality), influencing factors (physiological, psychological, situational), and performance (QOL, seizure frequency). Data analysis showed that the majority of the sample could be labeled as “poor sleepers” based on Pittsburgh Sleep Quality Index Scores (PSQI). Although sleep quality in other populations is associated with physical and mental QOL (Carpi et al., 2022), sleep quality was only related to physical QOL but not mental QOL in this study. Sleep quality was not associated with seizure frequency in this study. However, sleep medication use predicted increased seizure frequency in patients with PNES. Regarding influencing factors, psychological distress was found to be the only significant influencing factor in mental QOL; while psychological distress, employment status, and total number of years with PNES were significant factors in seizure frequency. Findings of this research expanded the knowledge of the important human experience of sleep quality and its relationships to QOL and seizure frequency outcomes in patients with PNES.

Theoretical Foundations

There are three major components in the TOUS: the symptom(s), influencing factors, and performance outcomes (Lenz and Pugh, 2018). The TOUS uses Rhodes and Watson's (1987) definition of symptoms, conceptualized as "the perceived indicators of change in normal functioning as experienced by patients" (p. 242), indicating that the TOUS is concerned with subjective experiences, The TOUS conceptualizes symptoms as having four measurable dimensions: intensity, timing, distress, and quality. Intensity is a quantifiable dimension that refers to the severity or strength of the symptom (Lenz et al., 1997). Timing refers to the frequency, duration, and/or patterns of symptom occurrence (Lenz et al., 1997). Distress refers to how much the person is bothered by the symptom (Lenz et al., 1997), and can be conceptualized as the emotional burden of the symptom (Lenz & Pugh, 2018). Quality refers to the nature of the symptom and what it feels like to experience it (Lenz et al., 2017). Lenz and Pugh (2018) stated that measurement of all four dimensions yields the most informative depiction of the symptom but measuring one to three dimensions is still valid in research. In the conceptual model used in the third manuscript of this dissertation, sleep quality was the subjective symptom of interest and was measured with the PSQI questionnaire. The PSQI contains questions that cover all four dimensions of symptoms as defined in the TOUS,
The results of the study showed that sleep quality was poor overall in a sample of patients with PNES.

Influencing factors for the conceptual model were chosen due to their possible associations with QOL and seizure frequency in patients with PNES. Two performance outcomes were chosen to include in the model: QOL and seizure frequency, influencing factors in the TOUS can interact with the symptom and/or the performance outcomes of interest. The study in the third manuscript was not designed to determine directionality or determine the relationships between influencing factors and the symptom of interest (sleep quality). Instead, data analysis was focused on associative relationships between influencing factors and sleep quality and QOL and seizure frequency.

Implications for Nursing Practice

Unfortunately, sleep is often overlooked during health assessments. Nurses who provide care to patients with PNES should consider routinely screening for sleep problems, even if the patient does not report it as a chief complaint. It is important that patients with PNES who present with sleep quality problems are referred for the appropriate treatment. Some physiologic sleep disorders that affect sleep quality such as sleep-disordered breathing or narcolepsy require medical management. However, poor sleep quality is often caused by behavioral issues. Because sleep is a modifiable behavior, improvements in a person's sleep can be achieved if they are given the right guidance and resources.

One of these resources is cognitive behavioral therapy for insomnia (CBT-I). However, few people receive CBT-I due to lack of access to trained clinicians (Dopheide, 2020). Behavioral sleep medicine (BSM) specialists use behavioral techniques to treat all sleep disorders, and frequently use CBT-I to treat insomnia (Fields et al., 2013). BSM-certified providers hold graduate level degrees in health-related fields and must meet minimum didactic and clinical requirements before being certified (Board of Behavioral Sleep Medicine, 2018). Thomas et al. (2016) reported that 88% of Behavioral Sleep Medicine (BSM) providers worldwide practice in the United States (U.S.). Thomas' team also found that BSM providers are unequally distributed at national and state levels. In 2015, Tennessee only had 14 BSM providers, and four states had no BSM providers. BSM providers were disproportionately located in dense urban areas. Even so, 63% of U.S. cities with populations of >150,000 had no BSM providers.

One solution to this lack of access to CBT-I would be to increase the number of providers who are certified to deliver it. One does not have to be a BSM-certified clinician to provide CBT-I. Master's-level advanced practice providers like nurse practitioners (NPs) are eligible to be trained in CBT-I. According to Fields et al. (2013), several studies have shown significant sleep improvements in patients who received CBT-I from NPs, including primary care NPs who were not certified as psychiatric-mental health nurse practitioners (PMHNPs). Therefore, encouraging NPs to become CBT-I certified could improve access to care for patients with PNES.

Another reason for underutilization of CBT-I relates to healthcare providers' beliefs of insomnia. Despite the American College of Physicians' recommendation that CBT-I be used as initial therapy for all patients with insomnia, healthcare providers continue to prescribe hypnotics and sleep hygiene changes as first-line treatment, despite insufficient evidence that these strategies work as monotherapies (Koffel et al., 2018) and the risks of residual effects, tolerance, dependence (Sharma & Andrade, 2012), and increased mortality (Kripke, 2018) with hypnotic use. Accordingly, nurses must stay up to date on current recommendations for management of sleep disorders. Additionally, NPs should be aware of the association between sleep medication use and increased incidence in weekly seizure frequency when prescribing medications to patients with PNES. Patients should be thoroughly educated on both prescribed and over-the-counter sleep medications too.

Implications for Research

The concept analysis, integrative review, and cross-sectional study in this dissertation revealed several gaps in our knowledge of PNES that need further exploration. There is still much we do not know about sleep quality problems in patients with PNES. For example, we are not sure what causes high rates of sleep disorders and poor sleep quality in this patient group. As mentioned in the third manuscript, many patients with PNES have characteristics that are associated with sleep disorders in other populations such as female gender, unemployment, and psychological disorders. Additional potentially important factors contributing to sleep quality are illness perception and perceived locus of control. Patients with PNES often report negative illness perceptions and an external locus of control over outcomes (Rawlings et al., 2017).

Dysfunctional illness perceptions have been linked to poor subjective sleep quality in other populations (Palagini et al., 2022), with one study finding that more sleep problems were reported in young people who perceived less control over their epilepsy (Rizou et al., 2016). Latreille et al. (2019) found that reports of poor sleep in patients with PNES were not confirmed by polysomnography. This paradoxical insomnia, in which there is a discrepancy between subjective and objective sleep measures, is common in a variety of medical and psychiatric disorders (Rezaie et al., 2018). Additionally, Hill et al. (1996) found that sleep loss negatively affected mood in subjects with perceived external locus of control. In future research, factors such as illness perceptions and locus of control should be investigated for their potential contribution to poor sleep quality in PNES. Additionally, there have been very few studies involving the use of polysomnography to investigate sleep characteristics in patients with PNES, all with small sample sizes and none performed in the controlled environment of a sleep laboratory. Further studies on sleep in PNES through polysomnography would clarify the differences between objective sleep characteristics versus subjective sleep experience in this patient group.

The third manuscript of this dissertation was the first study to examine the relationship between sleep quality, QOL, and frequency of seizures in PNES. These results need to be replicated, ideally in a sample of patients with PNES whose diagnosis can be confirmed by the researchers, The results of the hierarchical multiple regression analyses for physical and mental QOL showed that the models explained less than 20% of the variance. In future studies, the model should be expanded to include other variables such as illness perceptions and locus of control that may be associated with QOL and seizure frequency in PNES.

Along with the need for research on the effects of CBT-I in patients with PNES that was mentioned in chapter 4, another area for future research is to focus on the use of sleep medications in patients with PNES. Aside from the reported findings on the association between sleep medication use and an increased incidence of weekly seizures, the only available information is that patients with PNES use more sleep medications than patients with epilepsy (Latreille et al., 2019). For example, there is no information on the type and duration of sleep medications being used, and if they are prescribed by a physician or are over-the-counter. There is also limiting knowledge if more seizures are a byproduct of using sleep medications or related to some unknown factors. Filling the gaps in our knowledge of sleep medication use in patients with PNES can aid any healthcare provider including NPs to make better decisions when preparing the plan of care for sleep problems.

Another interesting finding reported in chapter 4 was the association between employment and decreased incidence of weekly seizures. Although the literature reports high rates of unemployment in patients with PNES, little is known about their employment history or the factors that influenced their employment. Employment may be a protective factor against seizures similar to the protective effects it has on depression and general mental health in other populations (Van der Noordt et al., 2014). However, Reuber et al. (2005) found that more than 40% of patients with PNES who achieved seizure remission did not enter or reenter the workforce, indicating that seizure control was not a major factor in their ability to work. To better understand this phenomenon, qualitative studies may help clarify how patients with PNES experience employment, their perceptions on employability, and how certain experiences such as posttraumatic stress or psychological distress impact their employment problems.

The convenience sample in this dissertation research largely consisted of women with positive history of trauma who exhibited similar characteristics of abused women. A future research direction is to conduct a qualitative phenomenological study and explore the lived experiences of women with PNES who suffer from poor sleep. The in-dept interviews can help gain insight into their thoughts and feelings during sleepless nights, and how they perceive about past traumas and the experience of sleep problems. In the literature, there are no qualitative studies on the experience of achieving seizure freedom in patients with PNES. Knowing how patients narrate their stories of seizure remission and the factors they believe moved them towards the path to recovery could help in the further development of PNES treatment strategies.

Finally, a review of the literature for the concept analysis on QOL in PNES showed that there are no PNES-specific QOL instruments, and none of the administered QOL instruments in PNES have been validated for use in this patient group (Wiseman et al., 2018). This may raise concerns about the accuracy of the data when measuring QOL or missing to examine all relevant QOL-domains. Some of the available QOL instruments like the Quality of Life in Epilepsy questionnaire which is frequently used in this patient group contain elements that are not applicable such as questions about antiepileptic drug side effects. Consequently, the development of a QOL instrument specific to PNES is warranted

References

Board of Behavioral Sleep Medicine. (2018). *BSM certification eligibility requirements*. https://www.bsmcredential.org/index.php/eligibility#bsm-certification-eligibility-requirements

Carpi, M., Cianfarani, C., & Vestri, A. (2022). Sleep quality and its associations with physical and mental health-related quality of life among university students: A cross-sectional study. *International Journal of Environmental Research and Public Health, 19*(5), Article 2874. https://doi.org/10.3390%2Fijerph19052874

Cobb, S. J., & Beebe, L. H. (2021). Quality of life in psychogenic nonepileptic seizures: An evolutionary concept analysis. *Issues in Mental Health Nursing,* 43(8), 730-736. https://doi.org/10.1080/01612840.2022.2035026

Dopheide, J. A. (2020). Insomnia overview: Epidemiology, pathophysiology, diagnosis, monitoring, and nonpharmacologic therapy. *The American Journal of Managed Care, 26*, S76-S84. https://doi.org/10.37765/ajmc.2020.42769

Fields, B. G., Schutte-Rodin, S., Perlis, M. L., & Myers, M. (2013). Master's-level practitioners as cognitive behavioral therapy for insomnia providers: An underutilized resource. *Journal of Clinical Sleep Medicine, 9*(10), 1093-1096. https://dx.doi.org/10.5664%2Fjcsm.3096

Hill, D. W., Welch, J. E., & Godfrey, J. A., III. (1996). Influence of locus of control on mood state disturbance after short-term sleep deprivation. *Sleep, 19*(1), 41-46. https://doi.org/10.1093/sleep/19.1.41

Kerr, W. T., Janio, E. A., Braesch, C. T., Le, J. M., Hori, J. M., Patel, A. B., Gallardo, N. L., Bauirjan, J., D'Ambrosio, S. R., Chau, A. M., Hwang, E. S., Davis, E. C., Buchard, A., Torres-Barba, D., Banna, M. A., Barritt, S, E., Cho, A. Y., Engel, J., Jr., Cohen, M. S., & Stern, J. M. (2017). Identifying psychogenic seizures through comorbidities and medication history. *Epilepsia, 58*(11), 1852-1860. https://doi.org/10.1111/epi.13888

Koffel, E., Bramoweth, A. D., & Ulmer, C. S. (2018). Increasing access to and utilization of cognitive behavioral therapy for insomnia (CBT-I): A narrative review. *Journal of General Internal Medicine, 33*(6), 955-962. https://doi.org/10.1007/s11606-018-4390-1

Kripke, D. F. (2018). Hypnotic drug risks or mortality, infection, depression, and cancer: But lack of benefit. *F1000Research, 5*(918), 1-25. https://doi.org/10.12688/f1000research.8729.3

Latreille, V., Dworetzky, B. A., Baslet, G., & Pavlova, M. (2019). Sleep disturbances in patients with psychogenic non-epileptic seizures: Is it all subjective? A prospective pilot study of sleep-wake patterns. *Seizure, 65*, 124-128. https://doi.org/10.1016/j.seizure.2019.01.016

Lenz, E. R., & Pugh, L. C. (2018). Theory of Unpleasant Symptoms. In M. J. Smith, & P. R. Leihr (Eds.), *Middle range theory for nursing* (4th ed., pp. 179-214). Springer Publishing Company.

Lenz, E. R., Pugh, L. C., Milligan, R., & Gift, A. (2017). Unpleasant symptoms. In S. J. Peterson, & T. S. Bredow (Eds.), *Middle range theories: Application to nursing research and practice* (4th ed., pp. 67-77). Wolters Kluwer.

Lenz, E. R., Pugh, L. C., Milligan, R. A., Gift, A., & Suppe, F. (1997). The middle-range theory of unpleasant symptoms: An update. *Advances in Nursing Science, 19*(3), 14-27. https://doi.org/10.1097/00012272-199703000-00003

Palagini, L., Zerbinati, L., Balestrieri, M., Murri, M. B., Caruso, R., D'Agnostino, A., Ferrara, M., Ferrari, S., Minervino, A., Massa, L., Milia, P., Miniati, M., Giulia, N. M., Petrucci, A., Pini, S., Politi, P., Porcellana, M., Rocchetti, M., Taddei, I., . . . Grassi, L. (2022). Poor sleep quality may contribute to dysfunctional illness perception, physical and emotional distress in hospitalized patients: Results of a national survey of the Italian Society of Consultation-Liaison Psychiatry. *Journal of Sleep Research*, Article e13617. Advance online publication. https://doi.org/10.1111/jsr.13617

Rawlings, G. H., Brown, I., & Reuber, M. (2017). Predictors of health-related quality of life in patients with epilepsy and psychogenic nonepileptic seizures. *Epilepsy & Behavior, 68*, 153-158. https://doi.org/10.1016/j.yebeh.2016.10.035

Reuber, M., Mitchell, A. J., Howlett, S., & Elger, C. E. (2005). Measuring outcome in psychogenic nonepileptic seizures: How relevant is seizure remission? *Epilepsia, 46*(11), 1788-1795. https://doi.org/10.1111/j.1528-1167.2005.00280.x

Rezaie, L., Fobian, A. D., McCall, W. V., & Khazaie, H. (2018). Paradoxical insomnia and subjective-objective sleep discrepancy: A review. *Sleep Medicine Reviews, 40*, 196-202. https://doi.org/10.1016/j.smrv.2018.01.002

Rhodes, V. A., & Watson, P. M. (1987). Symptom distress – The concept: Past and present. *Seminars in Oncology Nursing, 3*(4), 242-247. https://doi.org/10.1016/s0749-2081(87)80014-1

Rizou, I., De Gucht, V., Papavasiliou, A., & Maes, S. (2016). The contribution of illness perceptions to fatigue and sleep problems in youngsters with epilepsy. *European Journal of Paediatric Neurology, 20*(1), 93-99. https://doi.org/10.1016/j.ejpn.2015.10.001

Sharma, M. P., & Andrade, C. (2012). Behavioral interventions for insomnia: Theory and practice. *Indian Journal of Psychiatry, 54*(4), 359-366. https://doi.org/10.4103%2F0019-5545.104825

Thomas, A., Grandner, M., Nowakowski, S., Nesom, G., Corbitt, C., & Perlis, M. L. (2016). Where are all the behavioral sleep medicine providers and where are they needed? A geographic assessment. Behavioral Sleep Medicine, 14(6), 687-698. https://dx.doi.org/10.1080%2F15402002.2016.1173551

Van der Noordt, M., Ijzelenberg, H., Droomers, M., & Proper, K. I. (2014). Health effects of employment: A systematic review of prospective studies. *Occupational and Environmental Medicine, 71*, 730-736. http://dx.doi.org/10.1136/oemed-2013-101891

Wiseman, H., Mercer, G., Martin, R. C., & Reuber, M. (2018). Health-related quality of life:

Utility and limitations in patients with psychogenic nonepileptic seizures. In W. C. Lafrance, Jr., & S. C. Schachter (Eds.), *Gates and Rowan's nonepileptic seizures* (4th ed., pp. 165-177). Cambridge University Press.

Appendix

Appendix: Survey for Data Collection

Screening Questions

1. Has a healthcare provider diagnosed you with nonepileptic seizures (psychogenic nonepileptic seizures [PNES], nonepileptic attack disorder [NEAD], functional seizures, or dissociative seizures?

   ☐ Yes

   ☐ No

2. Are you 18 years old or older?

   ☐ Yes

   ☐ No

3. Do you currently live in the United States?

   ☐ Yes

   ☐ No

4. Are you English speaking?

   ☐ Yes

   ☐ No

5. Do you have a current diagnosis of epileptic seizures?

   ☐ Yes

   ☐ No

6. Are you receiving cognitive behavioral therapy for insomnia (CBT-I)? (Only click “Yes” if you are receiving CBT that is specifically designed to treat insomnia).

   ☐ Yes

   ☐ No

Demographics

Age: ______________

Sex: ☐ Male ☐ Female ☐ Prefer not to answer

Race:

- ☐ American Indian or Alaska native
- ☐ Asian
- ☐ Black or African American
- ☐ Native Hawaiian or other Pacific Islander
- ☐ White
- ☐ More than one race
- ☐ Other, please specify

____

Ethnicity:

- ☐ Hispanic origin
- ☐ Not of Hispanic origin

Marital Status:

- ☐ Single (never married)
- ☐ Married
- ☐ Partnered
- ☐ Divorced
- ☐ Widowed
- ☐ Separated

Household Income (yearly):

- ☐ Less than $20,000
- ☐ $20,000 - $34,999
- ☐ $35,000 - $49,999
- ☐ $50,000 - $74,999
- ☐ $75,000 - $99,999
- ☐ More than $100,000

Highest level of education:

- ☐ Less than a high school diploma
- ☐ High school degree or equivalent (e.g. GED)
- ☐ Some college, no degree
- ☐ Associate degree (e.g. AA, AS)
- ☐ Bachelor’s degree (e.g. BA, BS)
- ☐ Master’s degree (e.g. MA, MS, MEd)
- ☐ Professional degree (e.g. MD, DDS, DVM)

☐ Doctorate (e.g. PhD, EdD)

Employment Status:

☐ Employed or self-employed full time

☐ Employed or self-employed part time

☐ Per diem

☐ Unemployed

☐ On disability

☐ Retired

☐ Student

☐ Other, please specify ____________________

Disability Status:

☐ Receiving disability benefits

☐ Not receiving disability benefits

History of abuse or trauma (select all that apply):

☐ Physical abuse/trauma

☐ Sexual abuse/trauma

☐ Emotional abuse/trauma

☐ Other, please specify: ________________________________

Age at PNES onset: ____________

How many seizures have you had in the past 24 hours? ____________________

How many seizures have you had in the past 7 days? ____________________

How many seizures have you had in the past month? ____________________

Are you currently receiving any treatment for nonepileptic seizures (such as medication or psychotherapy)?

☐ Yes

☐ No

What type of treatment are you receiving? ____

How long have you been receiving treatment for nonepileptic seizures? ____________________

Pittsburgh Sleep Quality Index

INSTRUCTIONS:

The following questions relate to your usual sleep habits during the past month only. Your answers should indicate the most accurate reply for the majority of days and nights in the past month. Please answer all questions.

1. During the past month, when have you usually gone to bed at night?
   BED TIME ________________________
2. During the past month, how long (in minutes) has it usually taken you to fall asleep each night?
   NUMBER OF MINUTES ________________________
3. During the past month, what time have you usually gotten up in the morning?
   GETTING UP TIME ________________________
4. During the past month, how many hours of actual sleep did you get at night? (This may be different than the number of hours you spent in bed.)
   HOURS OF SLEEP PER NIGHT ________________________

For each of the remaining questions, check the one best response. Please answer all questions.

5. During the past month, how often have you had trouble sleeping because you…

	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
a. Cannot get to sleep within 30 minutes	☐	☐	☐	☐
b. Wake up in the middle of the night or early morning	☐	☐	☐	☐
c. Have to get up to use the bathroom	☐	☐	☐	☐
d. Cannot breathe comfortably	☐	☐	☐	☐
e. Cough or snore loudly	☐	☐	☐	☐
f. Feel too cold	☐	☐	☐	☐
g. Feel too hot	☐	☐	☐	☐
h. Had bad dreams	☐	☐	☐	☐
i. Have pain	☐	☐	☐	☐

j. Other reason(s), please describe
____

How often during the past month have you had trouble sleeping because of this?	☐	☐	☐	☐

	Very good	Fairly good	Fairly bad	Very bad
6. During the past month, how would you rate your sleep quality overall?	☐	☐	☐	☐

	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
7. During the past month, how often have you taken medicine (prescribed or “over the counter”) to help you sleep?	☐	☐	☐	☐
8. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?	☐	☐	☐	☐

	No problem at all	Only a very slight problem	Somewhat of a problem	A very big problem
9. During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?	☐	☐	☐	☐

	No bed partner or roommate	Partner/room mate in other room	Partner in same room, but not same bed	Partner in same bed
10. Do you have a bed partner or roommate?	☐	☐	☐	☐

If you have a roommate or bed partner, ask him/her/them how often in the past month you have had…

	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
a. Loud snoring	☐	☐	☐	☐
b. Long pauses between breaths while asleep	☐	☐	☐	☐
c. Legs twitching or jerking while you sleep	☐	☐	☐	☐

d. Episodes of disorientation or confusion during sleep	☐	☐	☐	☐
e. Other restlessness while you sleep; please describe below	☐	☐	☐	☐

____

Patient Health Questionnaire – 4

Over the last 2 weeks, how often have you been bothered by…

	Not at all	Several days	More than half the days	Nearly every day
1. Feeling nervous, anxious, or on edge	☐	☐	☐	☐
2. Not being able to stop or control worrying	☐	☐	☐	☐
3. Little interest or pleasure in doing things	☐	☐	☐	☐
4. Feeling down, depressed, or hopeless	☐	☐	☐	☐

Perceived Stress Scale – 10

The questions in this scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate by checking *how often* you felt or thought a certain way.

	Never	Almost never	Sometimes	Fairly often	Very often
1. In the last month, how often have you been upset because of something that happened unexpectedly?	☐	☐	☐	☐	☐
2. In the last month, how often have you felt that you were unable to control important things in your life?	☐	☐	☐	☐	☐
3. In the last month, how often have you felt nervous and “stressed?”	☐	☐	☐	☐	☐
4. In the last month, how often have you felt confident about your ability to handle your personal problems?	☐	☐	☐	☐	☐

5. In the last month, how often have you felt that things were going your way?	☐	☐	☐	☐	☐
6. In the last month, how often have you found that you could not cope with all the things you had to do?	☐	☐	☐	☐	☐
7. In the last month, how often have you been able to control irritations in your life?	☐	☐	☐	☐	☐
8. In the last month, how often have you felt that you were on top of things?	☐	☐	☐	☐	☐
9. In the last month, how often have you been angered because of things that were outside of your control?	☐	☐	☐	☐	☐
10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?	☐	☐	☐	☐	☐

Short Form – 12 version 2

This survey asks for your view about your health. This information will help keep track of how you feel and how well you are able to do your usual activities.

For each of the following questions, please mark the one box that best describes your answer.

	Excellent	Very good	Good	Fair	Poor
1. In general, would you say your health is:	☐	☐	☐	☐	☐

The following questions are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?

	Yes, limited a lot	Yes, limited a little	No, not limited at all
2. <u>Moderate activities</u>, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	☐	☐	☐
3. Climbing <u>several</u> flights of stairs	☐	☐	☐

During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities <u>as a result of your physical health</u>?

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
4. Accomplished less than you would like	☐	☐	☐	☐	☐
5. Were limited in the kind of work or other activities	☐	☐	☐	☐	☐

During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of your emotional problems (such as feeling depressed or anxious)?

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
6. Accomplished less than you would like	☐	☐	☐	☐	☐
7. Did work or activities less carefully than usual	☐	☐	☐	☐	☐

	Not at all	A little bit	Moderately	Quite a bit	Extremely
8. During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?	☐	☐	☐	☐	☐

These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give the one answer that comes closest to the way you have been feeling. How much of the time during the past 4 weeks...

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
9. Have you felt calm and peaceful	☐	☐	☐	☐	☐
10. Did you have a lot of energy	☐	☐	☐	☐	☐
11. Have you felt downhearted and depressed	☐	☐	☐	☐	☐

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
12. During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities	☐	☐	☐	☐	☐

(like visiting friends, relatives, etc.)?

Interpersonal Support Evaluation List – 12

Instructions:
For each of the following questions, please mark the one box that best describes your answer.

	Definitely false	Probably false	Probably true	Definitely true
1. If I wanted to go on a trip for a day (for example, to the country or mountains), I would have a hard time finding someone to go with me.	☐	☐	☐	☐
2. I feel that there is no one I can share my most private worries and fears with.	☐	☐	☐	☐
3. If I were sick, I could easily find someone to help me with my daily chores.	☐	☐	☐	☐
4. There is someone I can turn to for advice about handling problems with my family.	☐	☐	☐	☐
5. If I decide one afternoon that I would like to go to a movie that evening, I could easily find someone to go with me.	☐	☐	☐	☐
6. When I need suggestions on how to deal with a personal problem, I know someone I can turn to.	☐	☐	☐	☐
7. I don't often get invited to do things with others.	☐	☐	☐	☐
8. If I had to go out of town for a few weeks, it would be difficult to find someone who would look after my house or apartment (the plants, pets, garden, etc.).	☐	☐	☐	☐
9. If I wanted to have lunch with someone, I could easily find someone to join me.	☐	☐	☐	☐
10. If I was stranded 10 miles from home, there is someone I could call who could come and get me.	☐	☐	☐	☐
11. If a family crisis arose, it would be difficult to find someone who could give me good advice about how to handle it.	☐	☐	☐	☐
12. If I needed some help in moving to a new house or apartment, I would have a hard time finding someone to help me.	☐	☐	☐	☐

Vita

Sandra Jones Cobb worked as a registered sleep and electroencephalographic (EEG) technologist in North Carolina for 10 years. While working as a technologist at the University of North Carolina Hospital, she discovered she loved working with patients in the neuroscience intensive care unit and wanted to expand her knowledge in patient care. In 2013, Mrs. Cobb moved to Tennessee and started nursing school. She earned her Bachelor's of Science in Nursing (BSN) from the East Tennessee State University in 2017. While attending nursing school, she was involved in the Honors-in-Discipline program for undergraduate research. It was through this program that she was introduced to nursing research by Dr. Ken Phillips, who encouraged her to pursue a PhD in nursing.

Mrs. Cobb worked as a registered nurse in the surgical trauma/neuro intensive care unit at Holston Valley Medical Center in Kingsport, Tennessee from 2017 to 2019. During her time there, she specialized in the care of patients with neurological dysfunction and trauma. Mrs. Cobb taught classes to other unit nurses on EEG basics and burst suppression protocols using EEG for patients with neurotrauma.

Mrs. Cobb enrolled in the PhD in nursing program at the University of Tennessee Knoxville in 2017 and began classes immediately after obtaining her BSN. She was selected as a Tennessee Fellow for Graduate Excellence and worked as a graduate research assistant. She also enrolled in a concurrent Master's program and received her Master's of Science in Nursing for Family Nurse Practitioner in 2019. During her time in the program, she was the lead author in manuscripts published in the *Journal of the American Psychiatric Nurses Association* and *Issues in Mental Health Nursing*.